PHILIPS EnVisor Series Ultrasound System

User's Guide

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Philips EnVisor Series User's Guide

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Warnings

Electrical Shock Hazard

Do not remove system covers. To avoid electrical shock, use only supplied power cords and connect only to properly grounded wall (wall/mains) outlets.

Explosion Hazard

Do not operate the system in the presence of flammable anesthetics.

Electromagnetic Compatibility Hazard

Medical equipment needs to be installed and put into service according to the special electromagnetic compatibility guidelines provided in the *Philips EnVisor Series Safety and Standards Guide*.

Radio Frequency Communications Equipment Hazard

The use of portable and mobile RF communications equipment can affect the operation of medical equipment.

Safety Information

Before you use the Philips EnVisor series ultrasound system, be sure to read the *Philips EnVisor Series Safety and Standards Guide*. Before you use any transducer for the first time, be sure to read all applicable usage, patient-safety, operator-safety, and electrical-safety guidelines in the Safety-and-Standards and Transducer documentation for your system.

Warning Symbols Used on the EnVisor Series

⚠ Documentation: The product is marked with the following symbol when it is necessary to refer to the EnVisor Series Online Help or other documentation such as the *Philips EnVisor Series Safety and Standards Guide* or the *Philips EnVisor Series Transducer Guide*.

Dangerous voltages symbol: This symbol appears adjacent to high-voltage terminals. It indicates the presence of voltages greater than 1000 VAC (600 VAC in the United States).

ESD (electrostatic discharge) symbol: The product is marked with the following symbol to warn the user not to touch exposed pins. Touching exposed pins can cause electrostatic discharge, which can damage the product.

Monitor Radiation

The monitor used in this system complies with the FDA regulations that were applicable at the date of manufacture (21 CFR Subcategory J).

Prescription Device

The United States Food and Drug Administration requires the following labeling statement:

CAUTION

United States federal law restricts this device to use by or on the order of a physician.

CE Marking

CE 0123 marking is for Council Directive 93/42/EEC.

This system complies with the Medical Device Directive.

Authorized EU Representative

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This Guide

This guide provides information to help you use the EnVisor series ultrasound system. The following imaging systems are included in the EnVisor series:

- EnVisor (General Imaging)
- EnVisor C (Cardiac Imaging)
- EnVisor HD (High Definition Imaging)
- EnVisor C HD (Cardiac High Definition Imaging)

Intended Audience

The *EnVisor Series User's Guide* is intended for sonographers, physicians, and biomedical engineers who operate and maintain the ultrasound system.

Additional Documentation

In addition to this guide, the ultrasound system includes the following documentation for your reference:

- *Philips EnVisor Series Getting Started Guide*

  This guide includes information to help you get started using the ultrasound system.

- *Philips EnVisor Series Safety and Standards Guide*

  This guide includes critical information about the intended uses of the ultrasound system, patient and operator safety, device standards, and maintenance.

- *Philips EnVisor Series Transducer Guide*

  This guide identifies all of the transducers that you can use with the ultrasound system and provides information about transesophageal echocardiography (TEE), intraoperative, and endocavity transducers that you can use with the EnVisor series. This guide provides detailed information on the use and care of the Philips transducers that you can use with the ultrasound system.

- EnVisor Series Online Help

  The EnVisor Series Online Help provides information and step-by-step instructions for performing tasks with the ultrasound system.

- Philips EnVisor Series Quick Cards

  The Quick Cards provide answers to commonly asked questions.

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Using Online Help

Using Online Help

Using Online Help

The **EnVisor Series Online Help** window displays three tabs along the top of the left pane to help you navigate to specific topics:

- Click the Contents tab to view the contents of the online Help.
- Click the Index tab to search for topics by keyword.
- Click the Search tab to search the entire online Help.

Some words and phrases appear in blue text. If you click these words, a popup window is displayed with more information. To make the popup window disappear, click anywhere.

Online Help Icons

The online Help uses the following icons to help you identify online Help components and to navigate to topics quickly:

Icon	Description
	A book icon on the **Contents** tab represents a major set of topics. Click a closed book to reveal the underlying topics.
	A topic icon on the **Contents** tab represents an online Help topic. Click a topic icon in the left pane of the **EnVisor Series Online Help** window to display the topic in the right pane.
	The **Related Topics** button appears at the bottom of each topic to direct you to other topics that you might find useful. Click this button to display a list of topics, and then click the topic you want to view.
	Click the **Back** icon at the top of the window to return to the most recently viewed topic.
	Click the **Forward** icon at the top of the window to advance to the next topic in a previously viewed sequence.

Printing Online Help

To print the current online Help screen, press the **Record** key assigned to the printer you want to use.

EnVisor Series Overview

About the EnVisor Series

The EnVisor series includes the following systems:

- EnVisor – General imaging
- EnVisor C – Cardiac imaging
- EnVisor HD – High definition general imaging
- EnVisor C HD – High definition cardiac imaging

The EnVisor series is a powerful ultrasound imaging and image-review tool. The EnVisor series allows you to do the following:

- Image in a variety of modes, including 3D Mode and Panoramic Imaging
- Store, manage, and review images
- Perform measurements and calculations using the comprehensive analysis package
- Create, edit, and add images to reports
- Send images and patient information over a network
- **Note:** Some features are not available on all systems.

About the EnVisor HD Series

The EnVisor HD (High Definition) series includes the EnVisor HD and the EnVisor C HD. These systems have the following features:

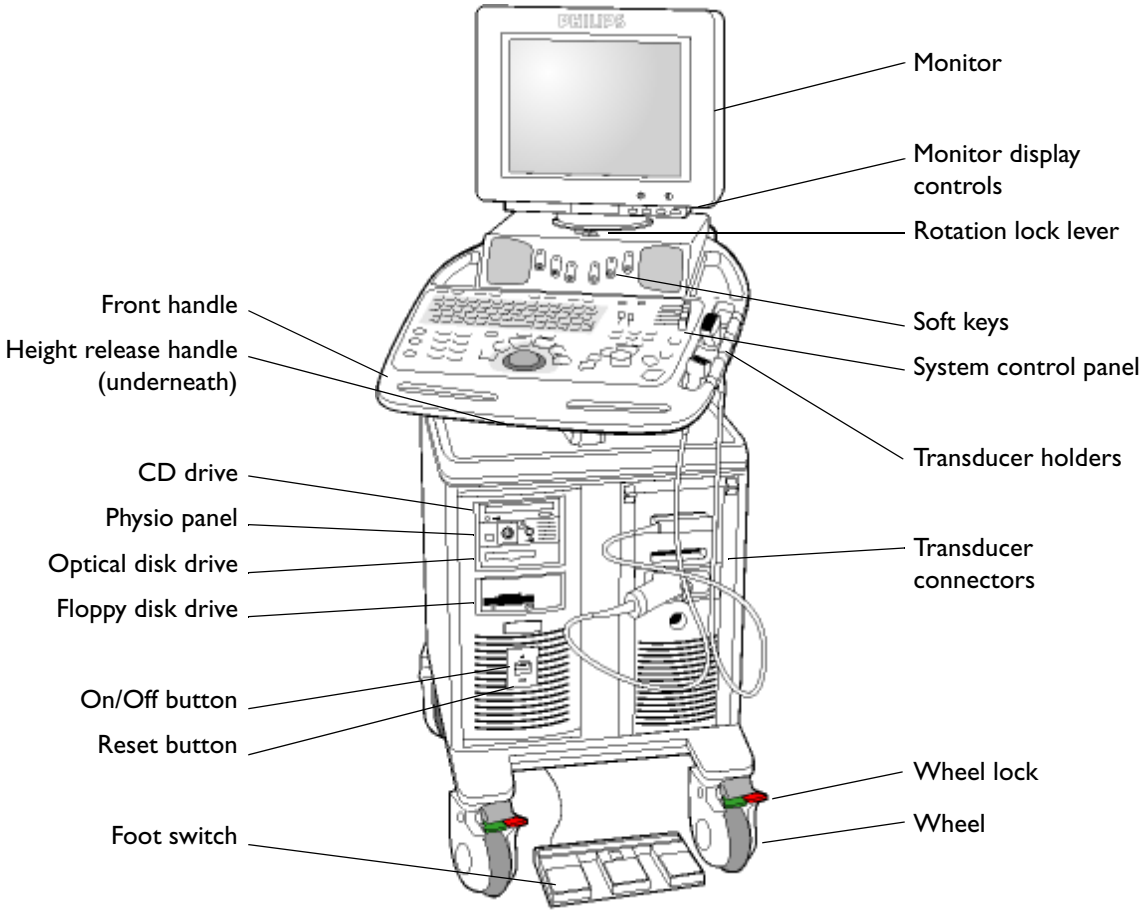
- Adaptive Doppler setting in PW Doppler and CW Doppler
- Adaptive Flow frequency setting in Color Mode
- Eight focal zones rather than four for some transducers
- Up to five fusion settings rather than three
- Panoramic Imaging
- Pulse Inversion settings in Tissue Harmonic Imaging
- Tissue Doppler
- Higher frame rates

2

System Components

About System Components

The system comprises a monitor, a system control panel, and a cart.



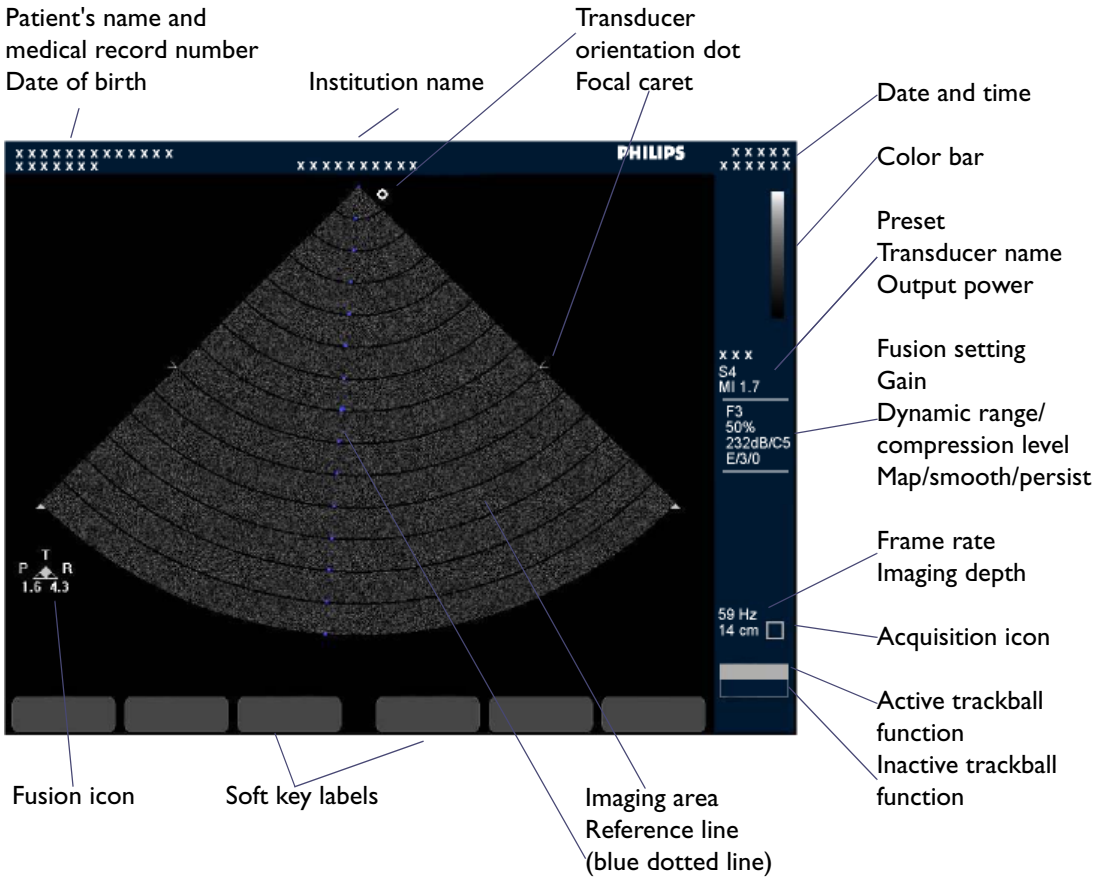
Notes:

- An optical disk drive is included with the DICOM Media option.
- The physio panel is an option and is a component of the cardiac and vascular application packages.
- Your system may not have the same number or types of transducer connectors. The fourth transducer connector is an option.

- The CD headphone jack is not functional on the EnVisor series.

About the Imaging Screen

The imaging screen looks somewhat different depending on the mode, the application, the preset, and the transducer. The imaging area, the soft key labels, and the settings, however, always remain at the same location. Click any area of the imaging screen to learn about that component.



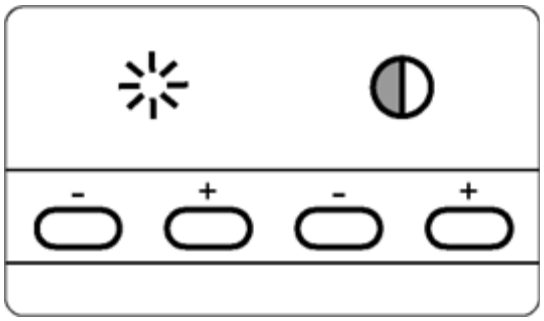
Adjusting the Monitor Display

Every time the ambient light changes, adjust the contrast and brightness of the monitor display.

To adjust the contrast and the brightness:

1. Press the **Setup** key.
2. Click the **System** tab.
3. Click **Monitor Adjust**.
4. Follow the instructions on the screen.

- To adjust the monitor brightness, press the + key or the - key below the brightness symbol on the front of the monitor.
- To adjust the monitor contrast, press the + key or the - key below the contrast symbol on the front of the monitor.



Changing the Tint of the Monitor

You can change the tint of the monitor. You have two options:

- Color 1: Bluish hue
- Color 2: Grayish hue

To view the current monitor tint setting, simultaneously press the + key and the - key below the brightness symbol on the front of the monitor:

The monitor tint setting (**Color 1** or **Color 2**) is displayed on the screen.

To change the tint of the monitor, press the + key and the - key again while the current monitor tint setting is still displayed.

Locating the System Serial Number

The system serial number, model number, and software revision for your system appear on a label above the input/output panel on the back of the system. They also appear in the **Options** window.

To locate the system serial number, model number, and software revision:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Options** tab.

3. Click the **Options** button.

   The **Options** window opens. The system serial number, model number, and software revision appear at the top of the **Options** window in the blue border.

4. Click **Close**.

Turning Your System On or Off

To turn your system on or off, press the On/Off button under the floppy disk drive.

Caution: Do not unplug the system from the wall until the system turns off completely. If you unplug the system before the system turns off completely, you will have to wait longer than usual to use your system the next time you turn it on. Some information on the system may also be corrupted.

Restarting Your System

If your system is frozen or is not working properly, follow this procedure to restart the system:

1. Press and release the On/Off button.

   If the system responds, wait for the system to shut down completely. Then press the On/Off button again to turn the system on.

2. Wait at least 60 seconds. If the system does not respond, press and release the small Reset button below the On/Off button.

If the system responds, it may require several minutes to restart.

3. If the system does not respond, press the On/Off button and hold it for ten seconds.

   If the system responds, wait for the system to shut down completely. Then press the On/Off button again to turn the system on. The system may require several minutes to restart.

4. If the system does not respond to the steps above, follow this procedure:
5. Unplug the power cord from the outlet.
6. Wait at least 30 seconds.
7. Plug the power cord back into the outlet.
8. Press the On/Off button.

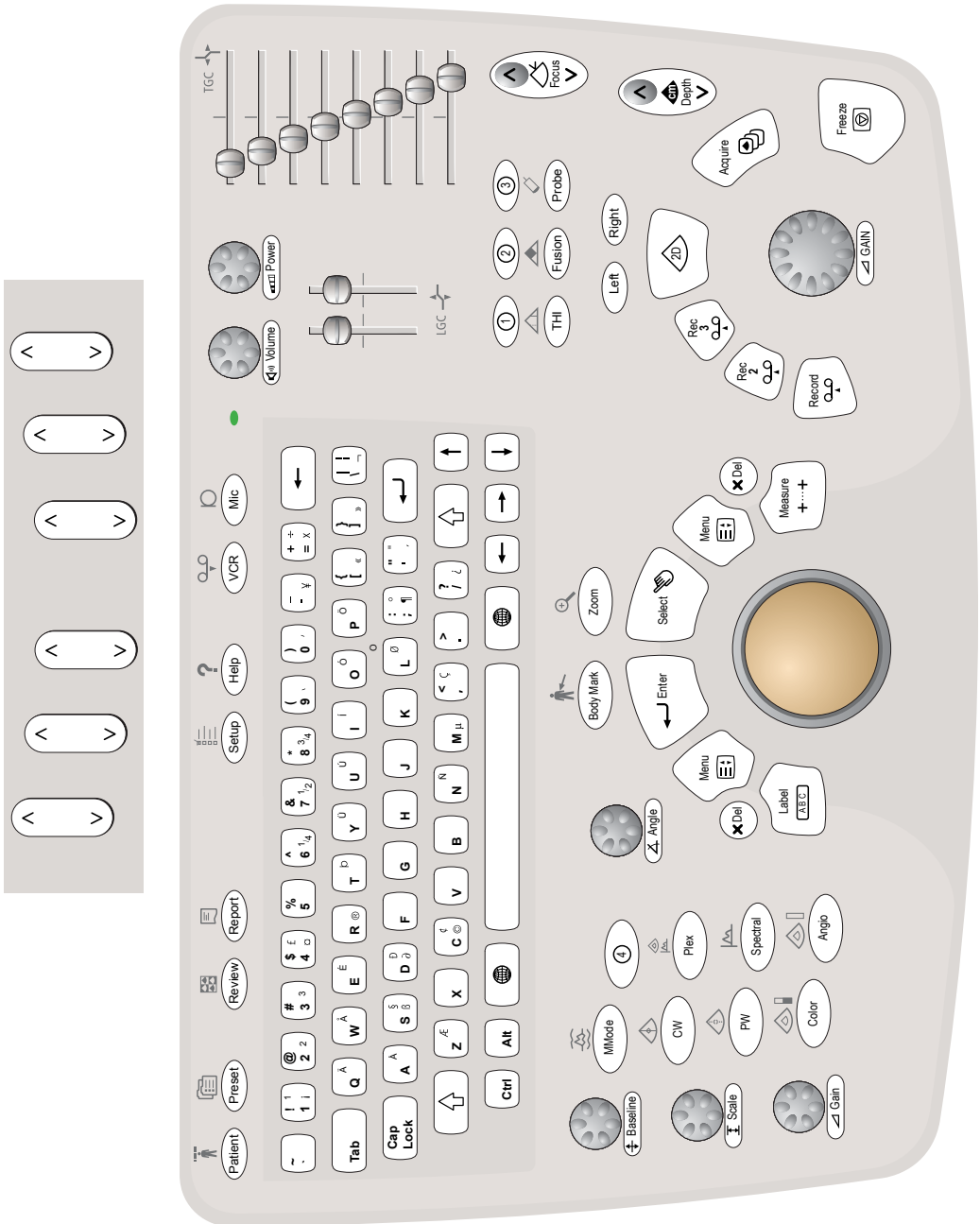
   The system may require several minutes to restart.

System Control Panel

About the System Control Panel

The system control panel is the horizontal surface that contains keys that you press, rotary controls that you turn, and slide controls that you move left and right or up and down. The keys, the rotary controls, and the slide controls are grouped with other controls with related functions. For instance, the Doppler controls are grouped in the lower left corner.

Using the System Control Panel



The system control panel contains the following keys, rotary controls, and slide controls:

2D

Press the **2D** key to exit the current imaging mode or application and return to 2D Mode. The previous 2D Mode settings are restored.

2D GAIN

Turn the 2D **GAIN** rotary control to adjust the gain, or overall brightness, of a 2D or MMode image. The 2D **GAIN** rotary control is located under the **2D** key and is labeled "**GAIN**."

Acquire

In live imaging, Stress Echocardiography, and Quick Review playback, press the **Acquire** key to start and stop the acquisition of a loop. When an image is frozen or when a spectral or an MMode trace is displayed, press the **Acquire** key to acquire a frame. The loop or frame is saved in the patient's study.

Angio

Press the **Angio** key to enter Color Power Angio or to add angio information to the reference image in PW Doppler or CW Doppler.

In Color Power Angio, press the **Angio** key, when an image is frozen, to temporarily suppress angio information from the frozen image without exiting Color Power Angio. This is called Angio Suppress.

Angle

In PW Doppler, an arrow, called the angle-to-flow arrow, appears on the imaging screen along with the Doppler cursor line. Use the **Angle** rotary control to position the angle-to-flow arrow parallel to and in the same direction as the blood flow.

Intelligent Doppler is on when you are in PW Doppler, you are using a linear transducer, and the **Steer** soft key is set to **Auto**. Turning the **Angle** rotary rotates the angle-to-flow arrow and automatically moves the Doppler cursor line to maintain maintain an optimum cursor angle between the angle-to-flow arrow and the direction of blood flow.

In 2D, Angio, or Color Mode, if you are using a linear transducer, turn the **Angle** rotary control to steer the 2D image or the color or angio box.

In 3D Mode or Panoramic Imaging, turn the **Angle** rotary control to rotate the image.

When placing an arrow label, turn the **Angle** rotary control to rotate the arrow.

When using body markers, turn the **Angle** rotary control to rotate the transducer icon.

Baseline

In PW and CW Doppler, turn the **Baseline** rotary control to adjust the zero baseline position in the Doppler spectral trace.

In Color Mode, turn the **Baseline** rotary control to shift the color map to unwrap aliased flow and display more hemodynamics.

In Color Power Angio, turn the **Baseline** rotary control to adjust the amplitudes displayed.

Body Mark

Press the **Body Mark** key to display the body marker soft keys and choose a body marker to place on the imaging screen.

Color

Press the **Color** key to enter Color Mode or to add color information to the reference image in PW Doppler, CW Doppler, or MMode.

In Color Mode, press the **Color** key when an image is frozen to temporarily suppress color information from the frozen image without exiting Color Mode. This is called Color Suppress.

CW

In a cardiac preset, press the **CW** key to display the CW spectral trace.

In a noncardiac preset, press the **CW** key to enter CW Preview, so that you can position the CW reference line. Press the **CW** key again to display the CW spectral trace.

Del (Label)

Press the **Del** key above the **Label** key to delete a selected label. If no label is selected, all of the labels are deleted.

When thumbnails are displayed in Image Review, press the **Del** key to mark or unmark selected images for deletion.

Del (Measure)

Press the **Del** key above the **Measure** key to delete a selected measurement. If no measurement is selected, all of the measurements are deleted.

When thumbnails are displayed in Image Review, press the **Del** key to mark or unmark selected images for deletion.

Depth

Press the up or the down arrow on the **Depth** key to increase or decrease the distance from the face of the transducer to the deepest point in the displayed image. The current imaging depth is displayed on the right side of the imaging screen.

In Zoom, press the up or the down arrow on the **Depth** key to increase or decrease the degree of magnification of the zoomed image.

In 3D Mode or Panoramic Imaging, press the up or the down arrow on the **Depth** key to enlarge or reduce the size of the image.

Doppler Gain

In PW and CW Doppler, turn the Doppler **Gain** rotary control to adjust the brightness of the spectral display. Adjusting the Doppler **Gain** also affects the volume of the audio output.

In Color and Color Power Angio, turn the Doppler **Gain** rotary control to adjust the intensity of the color or the angio.

In Triplex, the Doppler **Gain** rotary control affects spectral trace when **Gate** is highlighted on the bottom right corner of the imaging screen. It affects the color or angio gain when **Size** or **Position** is highlighted.

The Doppler **Gain** rotary control is located under the **Scale** rotary control and is labeled "**Gain**."

Enter

Use the **Enter** key in conjunction with the trackball to click an item or choose a menu option. Highlight the item or option with the trackball and press the **Enter** key.

In Zoom Preview, press the **Enter** key to magnify the area enclosed in the zoom box.

In PW Preview, CW Preview, or MMode Preview, press the **Enter** key to display the spectral or the MMode trace.

In CW or PW spectral Doppler, press the **Enter** key to specify whether the 2D reference image or the PW spectral trace is live.

In 3D Mode or Panoramic Imaging, press the **Enter** key while reviewing the 3D or panoramic image to specify whether the trackball moves the cursor or moves the image.

When using the trim tool in 3D Mode, press the **Enter** key to remove an area that you have traced with the trackball.

After you select a label with the trackball, press the **Enter** key to move the label. Press the **Enter** key again to place the label in the new position.

Focus

Press the up or the down arrow on the **Focus** key to move the location of the focal zone or focal zones, the area or areas where the image is most clearly focused.

Freeze

Press the **Freeze** key to freeze a live image and initiate Quick Review, which allows you to scroll through the frames using the trackball. Press the **Freeze** key again to unfreeze an image. Unfreezing an image removes all measurements and calculations from the image.

In Dual Imaging, press the **Freeze** key to freeze both images. Press the **Freeze** key again to unfreeze the active frozen image, which is labeled with an open circle.

When a 3D movie is playing in 3D Mode, press the **Freeze** key to stop the movie.

Fusion

Press the **Fusion** key to cycle through fusion frequency settings available for the selected transducer and the mode. Fusion settings apply to 2D Mode and Tissue Har-

monic Imaging. The icon on the lower left corner of the imaging screen summarizes information about the fusion setting.

Help

Press the **Help** key at any time to open or close the EnVisor series online Help.

Keyboard

Use the keyboard to type information into fields and to type labels, titles, and Quick Text onto the imaging screen.

To type a character that appears on the bottom right corner of a keyboard key, press the World key (labeled with a globe) and the keyboard key at the same time. To type a character that appears on the top right corner of a keyboard key, press the World key, the shift key, and the keyboard key at the same time.

Label

Press the **Label** key to display the Label soft keys and choose a label to place on the imaging screen.

In 3D Mode or Panoramic Imaging, press the **Label** key to display the **Title** soft key, which allows you to place a title above the image.

Left

In live imaging, press the **Left** key to enter Dual Imaging. The live image is on the left, and the frozen image appears on the right.

In Quick Review, press the **Left** key to enter Dual Imaging Quick Review. The frozen image is on the left, and the live image on the right.

In Dual Imaging, press the **Left** key to make the left image live. In Dual Imaging Quick Review, press the **Left** key to make the left image the active frozen image.

In Angio or Color Mode, press the **Left** key to turn Angio Compare or Color Compare on or off. Angio Compare or Color Compare displays the angio or color flow image on the right and a flow-suppressed version of the same image on the left.

LGCs

Move the **LGC** (Lateral Gain Control) slide controls up or down to adjust the amplification of a returning 2D signal. Use the left **LGC** slide control to control the left half

of the image area. Use the right **LGC** slide control to control the right half of the image area.

In general, align the **LGC** slide controls in the middle and adjust them as necessary.

Measure

Press the **Measure** key to display the measurement soft keys and to start an unlabeled measurement. A caliper appears on the image.

In Panoramic Imaging, press the **Measure** key to perform a two-point measurement.

Menu (Label)

Press the **Menu** key above the **Label** key to display the Label soft keys and choose a label to place on the imaging screen.

Menu (Measure)

Press the **Menu** key above the **Measure** key to display the Measurement soft keys and to choose whether the **Calculations** menu or the **Measurements** menu is displayed. From these menus, you choose a calculation or labeled measurement to perform.

Mic

Press the **Mic** key to turn the microphone on and off. A microphone icon appears in the right border of the imaging screen when the microphone is on. Use the microphone to record a voice annotation during a VCR recording.

MMode

In a cardiac preset, press the **MMode** key to display the MMode trace.

In a noncardiac preset, press the **MMode** key to enter MMode Preview. Press the **MMode** key again to display the MMode trace.

Use the **Next** soft key to display the second level of soft keys.

Option Keys (1, 2, 3, 4)

The option keys are labeled **1**, **2**, **3**, and **4**. Before using 3D Mode, Panoramic Imaging, Stress Echocardiography, or Tissue Doppler, you need to assign one of the option keys to the mode or application in the **Options** setup window. Press the associated option key to enter the mode or application.

Notes:

- 3D Mode is a component of the OB/GYN application package.
- Panoramic Imaging and Tissue Doppler are only available on the EnVisor HD series.
- Stress Echocardiography is an option.

Patient

Press the **Patient** key to open the **Patient Identification** window in which you can create a new patient study, edit information about the current patient, or restart a patient study that was started earlier the same day.

If you have Modality Worklist, when you press the **Patient** key, the **Patient Selection** window opens.

Plex

In 2D Mode, CW Doppler, or PW Doppler, press the **Plex** key to enter Duplex. Press the **Plex** key again to exit Duplex but remain in CW or PW Spectral Doppler.

In Color Power Angio or Color CW or PW Doppler, press the **Plex** key to enter Triplex. Press the **Plex** key again to exit Triplex but remain in CW or PW Spectral Doppler with Angio or Color Mode on.

Power

Turn the **Power** rotary control to vary the acoustic power transmitted for the current mode. The power setting appears on the right side of the imaging screen.

Preset

Press the **Preset** key to display the Preset soft keys and the **Preset** menu. Using the **Preset** menu and Preset soft keys, you can select, create, modify, or delete a preset. You can also remove the name of the preset from the imaging screen.

Probe

Press the **Probe** key to activate the next connected transducer going from top to bottom. The name of the current transducer appears on the right side of the imaging screen. The **Probe** key has no effect if only one transducer is connected.

PW

Press the **PW** key to enter PW Doppler Preview, so that you can position the Doppler sample volume gate. Press the **PW** key again to display the PW spectral trace.

Record, Rec2, Rec3

Before using a printer, a VCR, or a serial output cable for the first time, you need to assign the **Record**, **Rec2**, or **Rec3** key to the device in the **Peripherals** setup window. Press the assigned key to begin printing, recording, or exporting data over the serial output cable.

Report

Press the **Report** key to open the report for the current study.

Review

Press the **Review** key to open Image Review for the current study.

Right

In live imaging, press the **Right** key to enter Dual Imaging. The live image is on the right, and the frozen image appears on the left.

In Quick Review, press the **Right** key to enter Dual Imaging Quick Review. The frozen image is on the right, and the live image on the left.

In Dual Imaging, press the **Right** key to make the right image live. In Dual Imaging Quick Review, press the **Right** key to make the right image the active frozen image.

In Angio or Color Mode, press the **Right** key to turn Angio Compare or Color Compare on or off. Angio Compare or Color Compare displays the angio or color flow image on the left and a flow-suppressed version of the same image on the right.

Scale

In Color Power Angio, Color Mode, or CW or PW Spectral Doppler, turn the **Scale** rotary control clockwise to display higher velocities and frequencies. Turn the **Scale** rotary control counterclockwise to display lower velocities and frequencies. The **Scale** setting changes the pulse repetition frequency (PRF).

In Color Mode, the scale value appears on the right side of the imaging screen.

In Color Power Angio, the PRF value appears on the right side of the imaging screen.

In CW or PW Spectral Doppler, the scale is displayed in the trace area.

Select

Press the **Select** key to change the active function of the trackball. The possible functions of the trackball for the current mode, transducer, and preset are listed on the bottom right corner of the imaging screen. The active trackball function is highlighted, and its associated imaging screen elements appear in blue.

Use the **Select** key in conjunction with the trackball to choose an option from the **Preset**, **Label**, **Measurements**, or **Calculations** menu. Highlight the item with the trackball and press the **Select** key.

Setup

Press the **Setup** key to open the **Setup** window. The **Setup** window allows you to modify system and feature settings and, if you want, save those changes to new or existing presets.

Press the **Setup** key to display the physio soft keys.

Soft Keys

Soft keys are the oval keys above the system control panel and below the monitor. The functions of the soft keys change depending on the mode, the application, the preset, and the transducer. The function of each soft key is described above the soft key on the bottom of the imaging screen.

To use a soft key, press the up or the down arrow on the key to choose or change the selection that appears above the key on the imaging screen.

Press the **Previous** or the **Next** soft key to display more soft keys.

Spectral

In CW Preview or PW Preview, press the **Spectral** key to display the CW or the PW Doppler spectral trace, respectively.

Otherwise, press the **Spectral** key to display the PW Doppler spectral trace.

When a Doppler spectral trace is displayed, press the **Spectral** key to choose whether the spectral trace or the image is live. The soft keys change depending on which element is live, and they affect the element that is live.

TGCs

Move the **TGC** (Time Gain Compensation) slide controls to the right or left to adjust the amplification of the returning 2D signals at a specific image depth. The topmost **TGC** slide control controls the amplification at the face of the transducer.

For linear and curved linear transducers, align the **TGC** slide controls in the middle and make minor adjustments as necessary.

For sector transducers in cardiac presets, align the **TGC** slide controls in a diagonal line from the top left to the bottom right.

THI

Press the **THI** key to select Tissue Harmonic Imaging. Press it again to return to 2D Mode. The icon on the lower left corner of the imaging screen indicates the mode and the fusion setting.

Trackball

Use the trackball to move and resize objects on the imaging screen. The possible functions of the trackball for the current mode, transducer, and preset are listed on the bottom right corner of the imaging screen. The active trackball function is highlighted, and its associated imaging screen elements appear in blue. To change the active trackball function, press the **Select** key.

Use the trackball in conjunction with the **Enter** key to click an item or choose a menu option. Use the trackball to move the cursor over the item or option and press the **Enter** key.

In Quick Review, when **Scroll**, **Image**, or **Trace** is highlighted on the bottom right corner of the imaging screen, use the trackball to scroll through the image loop or trace frame by frame.

In Quick Review, when **Replay** is highlighted on the bottom right corner of the imaging screen, use the trackball to change the loop playback speed.

When making a trace measurement or when using the trim tool in 3D Mode, use the trackball to trace the area.

VCR

If a supported VCR is connected, press the **VCR** key to display the VCR soft keys. The VCR soft keys control the VCR functions.

If a nonsupported VCR is connected, press the **VCR** key to display the VCR input on the imaging screen.

Volume

Turn the **Volume** rotary control to adjust the volume of the speaker for CW and PW Doppler and for VCR playback.

Zoom

Press the **Zoom** key to place a zoom box on an image. Press the **Zoom** key again to magnify the area in the zoom box.

In 3D Mode or Panoramic Imaging, press the **Zoom** key to change the possible trackball functions displayed on the bottom right corner of the imaging screen.

Using Soft Keys

Soft keys are the oval keys above the system control panel and below the monitor. The functions of the soft keys change depending on the mode, the application, the preset, and the transducer. The function of each soft key is described above the soft key on the bottom of the imaging screen.

To use a soft key, press the up or the down arrow on the key to choose or change the selection that appears above the key on the imaging screen.

Next and Previous Soft Keys

When more than five soft keys are available, the far-right soft key becomes the **Next** soft key. To see the second level of soft keys, press the **Next** soft key. When the second level of soft keys is displayed, the **Previous** soft key appears. Press the **Previous** soft key to see the primary level of soft keys.

If You Do Not See a Soft Key That You Need

If the soft key that you are looking for does not appear,

- Press the **Next** soft key to see if it appears in the second level of soft keys.
- Press the **Select** key to change the word that is highlighted on the bottom right corner of the imaging screen. In some modes, such as Color MMode and Duplex, the soft keys change depending on the active function of the trackball.

Using the Trackball, the Enter Key, and the Select Key

The trackball, the **Enter** key, and the **Select** key work together somewhat like a computer mouse. Moving the trackball is like moving the mouse. Pressing the **Enter** key is like pressing the left button on a mouse. In Image Review, pressing the **Select** key is like pressing the right button on a mouse.

Clicking an Item on the Imaging Screen or Choosing an Option

To click an item on the imaging screen or to choose an option, use the trackball to move the cursor over the item or the option, and press the **Enter** key.

Changing the Active Function of the Trackball

In many circumstances, you can use the trackball for more than one function. The possible functions of the trackball for the current mode, transducer, and preset are listed on the bottom right corner of the imaging screen. The active trackball function is highlighted, and its associated imaging screen elements appear in blue. To change the active trackball function, press the **Select** key.

Choosing an Item in a Preset, Label, Measurements, or Calculations Menu

To choose an item in a **Preset**, **Label**, **Measurements**, or **Calculations** menu, use the trackball to highlight the item, and press the **Enter** key or the **Select** key.

Using the Select Key in Image Review and Reports

In Image Review and reports, press the **Select** key at any time to view the options that are currently available to you. To choose an option, highlight the option with the trackball, and press the **Enter** key.

Assigning Record Keys

You must assign a **Record** key to each VCR, printer, and serial output cable that is connected to your system. The **Record** keys, which appear on the system control panel, are labeled **Record**, **Rec2**, and **Rec3**.

To assign a **Record** key to a peripheral or to a serial output cable:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Peripherals** tab.

   The **Peripherals** window opens.

3. Choose the device from the drop-down menu that you want associated with each **Record** key.

4. Click **Apply**.

5. Click **Close**.

Note: When a Philips representative installs a peripheral, he or she types values for the following settings, which you may change when you assign a **Record** key to a peripheral:

- **Cycle Time** – The length of time the **Record** key is inoperable after you press it to print an image (applies only to video input printers)
- **Freeze Time** – The length of time an image is frozen after you press the **Record** key to allow a printer to capture a frame (applies only to video input printers)
- **Tape Time** – The time displayed on the imaging screen when a video tape is inserted into the VCR

Using the World Key

The World keys are labeled with a globe. They appear on either side of the space bar. Use a World key to type the characters that appear on the right side of some keys on the keyboard.

To type a character that appears on the bottom right corner of a keyboard key, press the World key and the keyboard key at the same time.

To type a character that appears on the top right corner of a keyboard key, press the World key, the shift key, and the keyboard key at the same time.

Typing an Apostrophe, a Quotation Mark, an Accent, a Tilde, or a Caret

In order to make an apostrophe ('), a quotation mark ("), an accent (`), a tilde (~), or a caret (^) appear when you are using the keyboard, you must type the character and then press the space bar.

Backups

About Backups

It is very important to back up the information on your system in case your system's memory fails for any reason.

Backing Up Presets and System Settings

You need to back up the presets that you create. If you do not and your system's memory fails, you will need to recreate all of the presets you created. If you need to create more presets than you can store on your system, you can save the presets to a disk and restore them when you need to use them.

Every time you back up presets, your system settings, user-defined calculations, printer and VCR settings, and options settings are automatically backed up. You can restore one or more of these at any time.

Backing Up Patient Studies

The data in your system's memory is temporary storage. You need to save any important patient data and images to an optical disk, a CD-R, or over a network. If your system's memory fails and you did not back up the patient studies, all patient information and images will be lost.

Notes:

- The ability to export data over a network is a component of the DICOM Basic option.
- An optical disk drive is included with the DICOM Media option.
- If you have the DICOM Media option, you can export studies in DICOM format. Those studies can be viewed on any DICOM viewer. If you do not have the DICOM Media option, exported studies can only be viewed on EnVisor A.1 systems.

Backing Up Presets and Settings to a Disk

You should regularly back up your presets and settings. If your system's memory fails for any reason and you did not save your presets and settings to a disk, you will lose all of this information.

You can create up to 20 presets for each exam type. If you need to create more presets, you can save presets to a disk and restore them when you need to use them.

To back up presets, system settings, printer and VCR settings, or options settings:

1. Insert a formatted 3.5" disk into the floppy disk drive.

   Caution: System settings, printer and VCR settings, and options that are already on the disk will be overwritten. If you try to save a preset with the same name as a preset already on the disk, you have to choose whether or not to overwrite the preset.

2. Press the **Setup** key.

   The **Setup** window opens.

3. Click the **Floppy Disk** tab.

   The **Floppy Disk** window opens.

4. Click **Backup**.

5. Select the check boxes for the presets you want to save, or select the **Select All** check box.

   Note: System settings, printer and VCR settings, and options are automatically saved.

6. Click **Start**.

7. Click **Close**.

Restoring Presets and Settings from a Disk

To restore presets, system settings, VCR and printer settings, or options from a disk:

1. Insert into the floppy disk drive the 3.5" disk that contains the presets or settings you want to restore.
2. Press the **Setup** key.

   The **Setup** window opens.
3. Click the **Floppy Disk** tab.

   The **Floppy Disk** window opens.
4. Click **Restore**.
5. Select the check boxes for the presets you want to restore, or select the **Select all** check box.
6. Click the check boxes for the settings you want to restore:

- System settings
- Printer and VCR settings
- **Options**

  Note: When you restore options, the system must have the same serial number as the system from which the backup was made.

7. Click **Start**.

   Note: The imaging screen is blank for a moment while the system restores the presets or settings.
8. Click **Close**.

Physios

About Physios

You can choose to display either the ECG or the auxiliary physio inputs, or the ECG and the auxiliary physio inputs on the imaging screen.

When you use a 12-lead ECG, display the auxiliary physio input.

In order to perform a Stress Echocardiography study, you must display an ECG or an auxiliary physio input on the imaging screen.

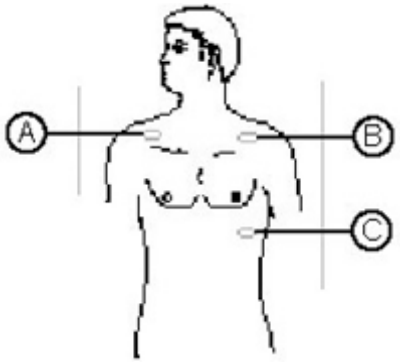
Connecting the ECG Cable and Attaching the ECG Leads

In order to display ECG physio inputs on the imaging screen, you must connect the ECG cable and properly attach the ECG leads.

Warning: Do not use ECG patient cables with detachable lead wires that have exposed male pins. Electrocution can result if these pins are plugged into AC power.

To connect the ECG cable and attach the ECG leads:

1. Plug the ECG cable into the port on the physio panel, which is under the CD drive and above the floppy disk drive.
2. Attach the ECG leads to the patient as shown below.



A = Right arm
B = Left leg
C = Left arm

Note: Although the lead placement does not match the anatomical labels on the leads, you need to attach the electrodes as shown in order to receive a good ECG signal.

3. Make sure the ECG signal appears properly on the imaging screen. If it does not, check the cable connections and the placement of the electrodes and leads.

Using Physio Soft Keys

To display the physio settings, press the **Setup** key. The physio soft keys appear under the **Setup** window.

To change any of the settings listed below, press the oval key below the soft key label.

Beats: Use the **Beats** soft key to specify how often (in number of R-waves) the 2D image is updated.

Display Dialog: Use the **Display Dialog** soft key to remove the **Setup** window from the imaging screen or to display the **Setup** window on the imaging screen.

ECG Gain or **Aux Gain:** Use the **ECG Gain** or the **Aux Gain** soft key to adjust the display size of the ECG or auxiliary trace.

ECG Invert or **Aux Invert:** Use the **ECG Invert** or the **Aux Invert** soft key to invert the displayed ECG or auxiliary input trace.

ECG Position or **Aux Position:** Use the **ECG Position** or the **Aux Position** soft key to move the ECG or auxiliary trace higher or lower on the imaging screen.

Select ECG or **Select Aux:** Use the **Select ECG** or the **Select Aux** soft key to change the **Gain**, the **Position**, and the **Invert** soft keys from **ECG** to **Aux**.

Sweep: Use the **Sweep** soft key to control the travel speed of the ECG or the auxiliary trace.

Changing Physio Settings

You can choose whether the ECG physio input, the auxiliary physio input, or the ECG and the auxiliary physio inputs appear on the imaging screen. You can also control the R-wave source and the R-wave beep.

To change physio settings:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Physio** tab.

   The **Physio** window opens.

3. Select either the **Display ECG** check box or the **Display Aux** check box, or both, to specify which input or inputs appear on the imaging screen.

4. Select the appropriate option buttons to turn the R-wave source on or off and to turn the R-wave beep on or off.

5. Click **Apply**.
6. Click **Close**.

Customizing Your System

Customizing Your System

You can customize your system in many ways to make it more useful for you. You can create presets designed specifically for the exams you perform, you can change system settings to reflect your needs, and you can add options to enhance your imaging abilities.

No matter how you customize your system, be sure to back up your presets, settings, and patient information regularly.

Presets

About Presets

A preset is a group of settings that optimizes the system for a specific type of exam. Presets establish many initial settings, such as gain value, color map, filter, and items on the **Label** and **Measurement** menus.

When you turn on your system, the most recently used preset is active. Before you begin an exam, be sure that the appropriate preset is active.

You can choose from several default presets. You cannot delete these default presets. However, they provide a starting point from which you can create your own presets. You can create up to 20 presets for each of the 8 exam types. If you need to create more than 160 presets, you can save presets to a disk and restore them when you need to use them.

Note: Presets are only available if you purchased the corresponding application-package option.

About Exam Types

Related presets are organized in categories called exam types. Presets are only available if you purchased the corresponding application-package option.

Exam Type	Application-Package Option
Abdominal	General Imaging
Abdominal Vascular	Vascular
Cardiac	Cardiac
Cardiac Vascular	Cardiac
Musculoskeletal	General Imaging
OB/GYN	OB/GYN
Pediatric	General Imaging
Small Parts	General Imaging
Vascular	Vascular

Selecting a Preset

Before you begin an exam, check to see if the correct preset is active. If it is not, select the appropriate preset.

To select a preset:

1. Press the **Preset** key.

   A menu appears with the current exam type at the top and all of the presets for that exam type listed below. Presets that you created appear above default presets.

2. Do one of the following:

   To choose one of the presets of the current exam type, highlight the preset with the trackball and press the **Enter** key or the **Select** key.

   Or

3. To choose a preset of another exam type, click the exam type at the top of the menu.

   A list of exam types appears.

4. Click the appropriate exam type.
5. Click the preset.

Creating a Preset

You can create a new preset based on a default preset or on a preset that you created previously.

To create a preset:

1. Select a preset that you want to use as a starting point for your preset.
2. Modify any settings that you want to change for your preset.
3. Press the **Preset** key.
4. Press the **Save Preset** soft key.
5. Click **Create New**.
6. Type the name of the preset you want to create.
7. Click **Save**.

Note: You can also create a new preset in the Setup window.

Modifying a Preset

You can make changes to any preset that you created. You cannot, however, modify default presets.

To modify a preset that you created:

1. Select the preset.
2. Modify any settings that you want to change for your preset.
3. Press the **Preset** key.
4. Press the **Save Preset** soft key.
5. Click **Modify Current**.
6. Click **OK**.

Note: You can also change a preset in the **Setup** window.

Deleting a Preset

You can delete that preset you created. You cannot, however, delete default presets.

To delete a preset:

1. Press the **Preset** key.
2. Highlight the preset you want to delete with the trackball.
3. Press the **Delete Preset** soft key.
4. Click **OK**.

Using Preset Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Delete Preset: Use the **Delete Preset** soft key to permanently delete the current preset. You can only delete presets that you created.

Display Name: Use the **Display Name** soft key to hide or display the name of the current preset on the imaging screen.

Save Preset: Use the **Save Preset** soft key to create a new preset or to make changes to a preset that you created.

Removing the Name of a Preset from the Imaging Screen

By default, the name of the preset appears on the imaging screen. You may, however, choose to hide the name and then display it again later.

To hide or display the name of the preset:

1. Press the **Preset** key.
2. Press the **Display Name** soft key.

Saving Setup Changes to a Preset

In the **Setup** window, the **Do not save changes to a preset** check box is selected by default. When it is selected, the changes you make in the **Setup** window are applied to the current state of the system, but the current preset is not changed.

If the **Do not save changes to a preset** check box is not selected, you can save your changes to a new or an existing preset.

Note: You must clear the check box *before* you make changes in order for the changes to be saved to the preset. If you clear the check box after you make changes, the changes will be applied to the current state of the system, but will not be saved to the preset.

To save changes made in the **Setup** window to a new or an existing preset:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Clear the **Do not save changes to a preset** check box.
3. Select a preset from the **User presets** list or the **Philips presets** list.
4. Click the appropriate tabs and modify any settings that you want to change for your preset.
5. Click **Save**.
6. If a default preset is selected, type the name of a new preset.

   If a preset that you created is selected, the changes are automatically made to that preset.
7. Click **Close**.

Options

About Options

The following are options that you must purchase separately:

- DICOM Basic
- DICOM Media
- DICOM Advanced
- On-Board Diagnostics (Resident Self Test)
- Printers, VCRs, and biopsy kits
- Stress Echocardiography

You must install software options before you use them.

Application-Package Options

You must purchase application-package options for the exam types that you want to perform. There are four application-package options:

- The Cardiac application package includes cardiac presets and the physio panel.
- The General Imaging application package includes abdominal, musculoskeletal, pediatric, and small parts presets.
- The OB/GYN application package includes obstetrical presets, gynecological presets, and 3D Mode.
- The Vascular application package includes vascular presets, abdominal vascular presets, and the physio panel.

Installing Options

When you receive your system, the options you purchased are installed and enabled. At some point, however, you may need to install a new option, remove an option, or disable an option.

To install an option, remove an option, or disable an option:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Options** tab.
3. Click the **Options** button.

   The **Options** window opens.
4. Do one of the following:

- To install an option with an access code, select an option, click **Install**, and type the access number.
- To install an option from a floppy disk, insert the disk into the floppy drive and click **Install From File**.
- To permanently remove an option, click **Remove**. A password is required to prevent accidental deletion of an option. Make a note of the confirmation number.

- To temporarily disable an option, clear the appropriate check box. To re-enable an option, select the appropriate check box.

5. Click **OK**.

Information in the **Status** column in the **Options** window indicates the status of each application:

- **Not installed** — An application that is not yet installed
- **Permanent** — An installed application
- **Expires on** [**date**] — A trial application that expires on the specified date
- **Expired** — An expired trial application
- **Removed** — A permanently deleted application

About Option Keys

Before you use any of the following, you must assign an option key to the application:

- 3D Mode (a component of the OB/GYN application-package option)
- Panoramic Imaging (only available on the EnVisor HD series)
- Stress Echocardiography (an option that you must purchase separately)
- Tissue Doppler (only available on the EnVisor HD series)

The option keys are labeled **1**, **2**, **3**, and **4**. To use the application, press the option key assigned to the application.

Assigning Option Keys

To assign an option key to 3D Mode, Panoramic Imaging, Stress Echocardiography, or Tissue Doppler:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Options** tab.
3. Click **Keyboard**.
4. To assign an option key to an application, select the application from the appropriate drop-down menu.

5. Click **OK**.
6. Click **Close**.

System Settings

About System Settings

In the **Setup** window, you can change a variety of settings that affect the configuration of your system. You can save settings to a preset unless they are system-wide settings.

You cannot save the following system-wide settings to a preset:

- **Top Border** — Changes the information that appears on the top of your imaging screen.
- **Date/Time** — Corrects the date or the time.
- **Locale** — Changes settings, such as language or currency, for your location.
- **DICOM** — Changes DICOM settings.
- **Monitor Adjust** — Allows you to adjust the contrast and brightness for the current lighting conditions.

You can save the following settings on the **System** tab in the **Setup** window to a preset:

- LGC profile display
- TGC profile display
- Depth marking
- TEE temperature units
- Power index
- **Activate body marker during freeze and dual**

These settings are described below:

Depth markings controls whether and where the depth markings appear:

- **Off –** No depth markings appear.
- **Vertical –** Depth markings appear on the right side of the imaging screen.
- **Both –** Depth markings appear to the left and the right of the image.
- **Left –** Depth markings appear to the left of the image.

- **Right –** Depth markings appear to the right of the image.
- **LGC profile display** controls whether or not a horizontal line, the LGC profile, appears on upper right corner of the imaging screen to indicate the LGC setting:
- **On –** The LGC profile always appears on the imaging screen.
- **Off –** The LGC profile does not appear on the imaging screen.
- **Auto –** The LGC profile appears on the imaging screen briefly while you are adjusting the LGC setting.

Power index controls the way the output power is measured and displayed:

- **Normal –** The most appropriate index based on the preset, transducer, and other factors
- **MI** (mechanical index) – raw acoustic power
- **TIS** (thermal index: soft tissue) – Temperature rise in soft tissue
- **TIB** (thermal index: bone) – Temperature rise in deep bone
- **TIC** (thermal index: cranial) – Temperature rise at the surface

TEE temperature units controls whether the TEE temperature is displayed in **Centigrade** or **Fahrenheit**.

TGC profile display controls whether or not a vertical line, the TGC profile, appears on the upper right corner of the imaging screen to indicate the TGC setting:

- **On –** The TGC profile always appears on the imaging screen.
- **Off –** The TGC profile does not appear on the imaging screen.
- **Auto –** The TGC profile appears on the imaging screen briefly while you are adjusting the TGC setting.

Changing System Settings

To change system settings:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **Top Border**, **Date/Time**, **Locale**, **DICOM**, or **Monitor Adjust** to change these system-wide settings:

   Note: You cannot save system-wide settings to a preset.

4. Click the appropriate option to change any of the following settings:

- LGC profile display
- TGC profile display
- Depth markings
- TEE temperature units
- Power index

5. Click **Apply**.
6. Click **Close**.

Specifying the Disk Full Strategy

You can specify the strategy the system uses when the disk is almost full. You have two choices:

- The oldest studies are automatically deleted when the disk is almost full.
- You are automatically prompted to specify which studies are deleted when you press the **Patient** key if the disk is almost full.

To specify the disk full strategy:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Acquisition** tab.

   The **Acquisition** window opens.

3. Click **Disk Full Strategy**.

   The **Disk Full Strategy** window opens.

4. Select the disk full strategy: **Automatically delete the oldest studies** or **Prompt the user to manually delete studies**.

5. Click **OK**.

6. Click **Apply**.

7. Click **Close**.

DICOM Features

About DICOM Features

DICOM format is used for patient studies that are transferred among computers that make up a hospital's information management system and for studies that are accessed by physicians at remote viewing stations. The EnVisor series offers three DICOM options:

- With the DICOM Basic option, you can export over a network to a DICOM PACS system or to a DICOM printer.
- With the DICOM Media option, you can export to an optical disk or a CD-R in DICOM format.
- With the DICOM Advanced option, you can use Modality Worklist and Modality Performed Procedure Step..

Before you use DICOM features, you must enter DICOM settings for your system and assign DICOM servers.

Caution: If you want to change DICOM settings not covered in this book, see your network administrator. Do not make any changes to network settings without consulting with your network administrator.

Entering DICOM Settings

You must enter DICOM settings for your EnVisor system before you connect your system to the network. Ask your network administrator if you have questions.

To enter DICOM settings for your EnVisor system:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **This System** tab.

   The **This System** window opens.

5. In the **System Name** area, enter the AE title for your system specified by your network administrator.

   Note: The AE title for each device on the network must be unique.

6. In the **System port number** area, use the up or the down arrow to enter the port number specified by your network administrator.

   Note: The default port number, 104, is assigned to ultrasound systems at most institutions.

7. In the **Network settings** area, click the **Network settings** button.

   The **Internet Protocols** (**TCP/IP**) **Protocols** window opens.

8. Enter the TCP/IP parameters specified by your network administrator.

9. Click **OK**.
10. Click **OK**.
11. Click **Close**.

Assigning DICOM Servers

You must assign DICOM server before you connect your system to the network. Ask your network administrator if you have questions.

To assign DICOM servers:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **System** tab.

   The **System** window opens.
3. Click **DICOM**.

   The **DICOM Setup** window opens.
4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.
5. In the **Servers** area, click **New**.
6. Assign a name to the sever and type it in the **Name** field.

   Note: This name will be used in all dialog boxes and error messages that relate to this server.
7. Type the **AE Title** and **Host** specified by your network administrator in the respective fields.

   Note: You may want to make the AE title the same as the server name.
8. Modify the server settings as specified by your network administrator by clicking the up and the down arrows to the right of the settings.
9. In the **Servers** area, click **Done**.

10. To assign each server to the appropriate DICOM role, click **Modify** in the **Roles** area.
11. For each DICOM role, choose the appropriate server from the drop-down list.
12. To specify the parameters for each role, click the **Advanced** button to the right of the drop-down menu.
13. In the **Roles** area, click **Done**.
14. Click **OK**.
15. Click **Close**.

Automatic DICOM Export

About Automatic DICOM Export

You can set up automatic DICOM export so that images are automatically exported over a network when you press the **Acquire** key or when you save or close a study.

You can set up automatic study deletion so that a study is automatically deleted as soon as all of its images are exported over a network.

Note: The ability to export to a DICOM PACS system or a DICOM printer is a component of the DICOM Basic option.

Setting Up Automatic DICOM Export

Before you use automatic DICOM export, you must assign and select a valid Storage SCP server. That is where the images are saved. You may also select a Storage Commit SCP server. Images exported to the Storage SCP server are backed up on the Storage Commit SCP server.

If you have any questions about servers, ask your network administrator.

To set up automatic DICOM export:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.

5. In the **Roles** area, click **Modify**.
6. Select the appropriate server from the **Storage SCP** drop-down list.
7. (Optional) Select the appropriate server from the **Storage Commit SCP** drop-down list.
8. Click the **Advanced** button to the right of **Storage SCP**.

   The **Network Export Preferences** window opens.

9. Click the **Auto Store** tab.
10. Click the appropriate option and press the **Enter** key:

- **Manual export only** – You must export over a network manually.
- **Batch mode** – All images are automatically exported over a network when you save or close the study.
- **Send as you go** – Each image is automatically exported over a network when you press the **Acquire** key.

11. Click **Done**.
12. Click **OK**.
13. Click **Close**.

Notes:

- The ability to export to a DICOM PACS system or a DICOM printer is a component of the DICOM Basic option.
- Before you turn off your system at the end of each day, check the DICOM job manager to make sure that the queue is empty to insure that all studies have been sent to the PACS.

Changing the Image Format for DICOM Export

You can choose the format of images that are exported over a network.

To change the image format:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.

5. In the **Roles** area, click **Modify**.
6. Click the **Advanced** button to the right of **Storage SCP**.

   The **Network export preferences** window opens.

7. Click the **Image Format** tab.
8. Click **Palette Color** or **RGB**.

   Note: Choose **RGB** only if your PACS and DICOM viewer do not support Palette Color. Palette Color format uses less space on the server and provides better viewing.

9. Click **OK**.
10. Click **OK**.
11. Click **Close**.

Setting Up Automatic DICOM Study Deletion

You can set up automatic study deletion so that a study is automatically deleted as soon as all of its images are exported over a network. Automatic study deletion is associated with automatic DICOM export.

To turn automatic study deletion on or off:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.

5. In the **Roles** area, click **Modify**.

6. Click the **Advanced** button to the right of **Storage SCP**.

   The **Network Export Preferences** window opens.

7. Click the **Auto Delete** tab.

8. Click the appropriate option and press the **Enter** key:

- **No Auto Deletion** — Studies are not deleted from your system when they are exported over the network. When space is limited on your system, the oldest studies are automatically deleted, or you are prompted to delete studies (according to the Disk Full Strategy).
- **Immediate Auto Delete** — A study is automatically deleted when all of its images are exported over a network.

  Note: If you assigned a server to the Storage Commit SCP, studies are not deleted

until the Storage Commit SCP notifies the Storage SCP that a copy of the studies has been made.

9. Click **OK**.
10. Click **OK**.
11. Click **Close**.

Notes:

- If you have any questions about servers, as your network administrator.
- DICOM export is a component of the DICOM Basic option.

Automatic DICOM Printing

About Automatic DICOM Printing

You can set up automatic DICOM printing so that images are automatically sent to a DICOM printer when you press the **Acquire** key or when you save or close a study.

Notes:

- By default, a page is not printed until six images are sent to the DICOM printer.
- The ability to print to a networked DICOM printer is a component of the DICOM Basic option.

Setting Up Automatic DICOM Printing

To set up automatic DICOM printing:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **System** tab.

   The **System** window opens.
3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.

5. In the **Roles** area, click **Modify**.
6. To specify a black-and-white printer, select the appropriate server from the **B&W Printer SCP** drop-down list.
7. To specify a color printer, select the appropriate server from the **Color Printer SCP** drop-down list.
8. To change the automatic DICOM printing setting, click the **Advanced** button to the right of **B&W Printer SCP** or **Color Printer SCP**.

   The **Printer Configuration** window opens.

9. Click the **Auto-Print** tab.
10. Click the appropriate option and press the **Enter** key:

- **Manual print only** — You must print manually.
- **Batch mode** — All frames are automatically printed when you save or close the study.
- **Send as you go** — Each frames is automatically printed when you press the **Acquire** key.

11. Click **OK**.
12. Click **Close**.

Note: The ability to print to a networked DICOM printer is a component of the DICOM Basic option.

Changing DICOM Printer Settings

You can change many DICOM printer settings in the B&W Printer Configuration window and the Color Printer Configuration window.

Information about each setting appears in the **Description** area. The DICOM information about each setting appears below the **Description** area.

Some drop-down menus include **Printer specific** so that you can enter a value used specifically for your printer. If you choose **Printer specific**, you can type a value in the field to the right of the drop-down menu.

To change the DICOM printer settings:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.

5. In the **Roles** area, click **Modify**.

6. Click the **Advanced** button to the right of **B&W Printer SCP** or **Color Printer SCP**.

   The **B&W Printer Configuration** or **Color Printer Configuration** window opens.

7. Click the **Basic**, **Layout**, **Density**, or **Advanced** tab.

8. Click **OK**.

9. Click **Done**.

10. Click **OK**.

11. Click **Close**.

Note: The ability to print to a DICOM printer is a component of the DICOM Basic option.

Canceling DICOM Print Jobs

To cancel print jobs that you sent to a DICOM printer:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Diagnostics** tab.

   The **Diagnostics** window opens.

5. Click **Jobs**.

   The **Job Manager** window opens.

6. Use the trackball to highlight the print job you want to delete.
7. Press the **Enter** key.
8. Click **Delete Job**.
9. Click **Close** to close the **Job Manager** window.
10. Click **OK**.
11. Click **Close**.

Note: The ability to print to a networked DICOM printer is a component of the DICOM Basic option.

Modality Worklist

About Modality Worklist

If your system is connected to the hospital information system (HIS), Modality Worklist allows you to display and choose from a list of scheduled patients. When you select a patient from the list, the **Patient Identification** window appears, populated with the patient's demographic information.

If you temporarily disconnect your system from the HIS, you can still use Modality Worklist. The most recent information from the HIS is stored on your system and is updated when you reconnect to the HIS.

If you specify a server for Modality Performed Procedure Step (MPPS), your system notifies the HIS when a patient study is complete. The list of scheduled patients and patient billing information can then be updated.

Notes:

- Before you use Modality Worklist, you must specify the Modality Worklist server.
- Modality Worklist is a component of the DICOM Advanced option.

Using Modality Worklist

To use Modality Worklist:

1. Press the **Patient** key.

   The **Patient Selection** window opens. It lists the scheduled patients.

2. To sort by exam time, last name, or another category, click the appropriate column header.
3. (Optional) Search for the patient.

- Type one or more letters or numbers in the **Find** field and choose a column from the **In Column** drop-down menu. As you type, the list changes to show only the patients that match your criteria.
- To find a subset of the results, type a value for a different column in the **And** field and choose the column from the **In Column** drop-down menu.
- To start a new search, click **Clear filter**.

4. Do one of the following:

- Click the name of the patient and click **OK** or press the **Patient** key. The **Patient Identification** window opens and is populated with the patient's demographic information.
- If the patient's name does not appear in the **Patient Selection** window, click **Manual Entry**. A blank **Patient Identification** window opens.

Notes:

- If you click **Manual Entry**, the HIS will not be updated when the exam is complete, and the patient's billing information will need to be updated manually.
- Before you use Modality Worklist, you must specify the Modality Worklist server.
- Modality Worklist is a component of the DICOM Advanced option.

Setting Up Modality Worklist

If you set up Modality Worklist, a list of scheduled patients appears when you press the **Patient** key. If you select an MPPS server, the list of scheduled patients will be updated when you complete a study.

To set up Modality Worklist:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.

5. In the **Roles** area, click **Modify**.
6. Select the Modality Worklist server from the **MWL SCP** drop-down menu.
7. Select the Modality Performed Procedure Step server from the **MPPS SCP** drop-down menu.

   Note: If you do not select an MPPS server, the list of scheduled patients will not be updated.

8. Click **Done**.
9. Click **OK**.
10. Click **Close**.

Notes:

- If you have any questions about servers, ask your network administrator.
- Modality Worklist is a component of the DICOM Advanced option.

Changing Modality Worklist Settings

You can specify which scheduled patients appear in the Modality Worklist. You can either choose from several default queries, or you can modify one of the default queries.

You can also specify how often your system retrieves patient information from the hospital information system (HIS).

To change Modality Worklist settings:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **System** tab.

   The **System** window opens.

3. Click **DICOM**.

   The **DICOM Setup** window opens.

4. Click the **Servers & Roles** tab.

   The **Servers & Roles** window opens.

5. In the **Roles** area, click **Modify**.
6. Click the **Advanced** button to the right of **MWL SCP**.

   The **Set Modality Worklist Query** window opens.

7. To specify which scheduled patients should appear in the Modality Worklist, click the query you want.
8. (Optional) To modify a query, click the **Edit** button to the right of the query.
9. (Optional) To restore the queries to their original settings, click **Restore Defaults**.

10. To specify how often your system should retrieve information from the HIS, click the up or the down arrow in the **MWL Polling Frequency** area.
11. Click **OK**.
12. Click **Done**.
13. Click **OK**.
14. Click **Close**.

Notes:

- If you have any questions about servers, ask your network administrator.
- Modality Worklist is a component of the DICOM Advanced option.

3

Imaging Modes

About Imaging Modes

The EnVisor Series offers several imaging modes to accommodate a variety of imaging applications. Some modes display a live grayscale image. Others are Doppler modes that evaluate color or angio blood flow or present information in a spectral form. Special modes are also available for 3D imaging and panoramic imaging.

Note: Some modes might not be available on your system.

General Imaging Information

About Imaging Modes

The EnVisor Series offers several imaging modes to accommodate a variety of imaging applications. Some modes display a live grayscale image. Others are Doppler modes that evaluate color or angio blood flow or present information in a spectral form. Special modes are also available for 3D imaging and panoramic imaging.

Note: Some modes might not be available on your system.

Beginning an Exam

Before you begin acquiring images, you must press the **Patient** key and click **New** to create a patient study. If you do not, you cannot acquire images.

Acquiring an Image

You can acquire a single frame or an image loop. The loop or frame is saved in the patient study. If Automatic DICOM Export is on, images are automatically exported across a network when you press the **Acquire** key.

To acquire a loop, press the **Acquire** key in live imaging or in Quick Review.

To acquire an image, press the **Freeze** key and then the **Acquire** key.

Notes:

- When it is possible to acquire an image, a small, open box, the acquisition icon, appears on the bottom right corner of the imaging screen to the right of the transducer frequency and depth.

- When an image is acquired, you hear a beep to confirm that the loop or frame was saved in the patient's study.
- If you press the **Acquire** key while a live MMode or Doppler trace is displayed, you acquire an image, not a loop.
- Automatic DICOM Export is a component of the DICOM Basic option.

Setting the Length of a Loop

You can specify the length (in seconds or number of heartbeats) of an acquired loop.

To specify the length of a loop:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Acquisition** tab.

   The **Acquisition** window opens.
3. Do one of the following:

- To define the length of the loop in number of heartbeats, choose **Beats**.
- To define the length of the loop in seconds, choose **Time**.

4. To change the number of **Seconds** or **Heartbeats**, click the up or the down arrow.
5. Click **Apply**.
6. Click **Close**.

Specifying Acquisition Preferences

You can control some aspects of image acquisition.

To specify acquisition preferences:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Acquisition** tab.

   The **Acquisition** window opens.

3. If you want the blue border around the image to be saved when you press the **Acquire** key, select the **Acquire Border** check box.
4. If you want to switch to Image Review after you press the **Acquire** key, select the **Switch to Review after acquire completes** check box.
5. If you want to hear a beep after an image is acquired, select the **Beep after acquire completes** check box.
6. Click **Apply**.
7. Click **Close**.

Printing in Live Imaging

You must assign a **Record** key to a printer or a VCR before you can use it.

To print an image, press the **Record** key assigned to the printer you want to use.

During printing, a printer icon appears and the soft keys disappear. You cannot start printing again until the printer icon is removed from the screen.

Notes:

- The ability to print to a networked DICOM printer is a component of the DICOM Basic option.
- You cannot assign a **Record** key to a DICOM printer.
- Pressing the **Record** key assigned to a VCR begins a VCR recording.

Changing the Image Size

You can specify the size of the image. Your choices are **Medium** and **Large**.

To change the image size:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **System** tab.

   The **System** window opens.
3. Click the **Large** or **Medium** option button to specify the **2D image size**.

4. Click **Apply**.
5. Click **Close**.

Resizing and Repositioning a Box

To resize an angio, color, ROI, or zoom box:

1. Press the **Select** key until **Size** is highlighted on the bottom right corner of your imaging screen.
2. Use the trackball to change the size of the box.
3. To reposition an angio, color, ROI, or zoom box:
4. Press the **Select** key until **Position** is highlighted on the bottom right corner of your imaging screen.
5. Use the trackball to reposition the box.

Note: If you change the size or position of an angio or a color box, the 2D image will, if necessary, move or become larger to accommodate it.

2D Mode

About 2D Mode

2D Mode is the most commonly used imaging mode. In 2D Mode, the image is displayed in grayscale.

The **2D** key is unique. Whenever you press the **2D** key, you exit the current mode and return to 2D Mode. The previous 2D settings are restored.

Using 2D Mode

To use 2D Mode:

1. Press the **2D** key.
2. If necessary, adjust the following controls to optimize the image:

- 2D GAIN rotary control
- Depth and Focus keys
- LGC and TGC slide controls

3. To change the appearance of your image, use the soft keys.

4. (Optional) To change the fusion setting, press the **Fusion** key.
5. (Optional) If you're using a linear transducer, use the **Angle** rotary control to steer the 2D image.
6. To exit, press the key for any other imaging mode.

Using 2D Mode Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Biopsy: Use the **Biopsy** soft key to initiate the biopsy feature. **Biopsy** has three settings:

- **Off** – Turns the Biopsy feature off.
- **Needle** – Two guide lines appear that outline the area in which the biopsy needle path is most likely to be.
- **Gun** – One guide line appears that shows the anticipated path of the biopsy needle.

The **Biopsy** soft key is only available when you are in 2D Mode and a noncardiac preset and are using a transducer that supports biopsy.

Warnings:

- See the EnVisor Series Transducer Guide for important information about using biopsy-capable transducers.
- Biopsy guide lines are intended as guides only. Never use biopsy guide lines as an absolute reference.
- Biopsy guide lines do not take into account the possible bending of the needle.

Colorize: Use the **Colorize** soft key to assign a colorization map that replaces the grayscale map to improve contrast resolution. The choices are **Sepia**, **Rainbow**, **Thallium**, and **Wheat**.

In MMode and Doppler Mode, the **Colorize** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Compress: Use the **Compress** soft key to adjust the compression of returning echos, which affects the grayscale display. Increasing **Compress** softens the image. Decreasing **Compress** produces a high-contrast image.

The compression setting appears on the right side of the imaging screen.

Focal Zones: Use the **Focal Zones** soft key to add focal zones. Focal zones are the areas where the image is most clearly focused. If you have an EnVisor HD or EnVisor C HD, you can choose up to eight focal zones, depending on the current imaging depth and the transducer you are using. Otherwise, you can choose up to four focal zones. If you are using Trapezoidal Imaging, you can choose no more than four focal zones. Using multiple focal zones decreases the frame rate.

Each time you press the **Focal Zones** soft key, you increase the number of focal zones or the space between them. When you reach the maximum number of focal zones, pressing the **Focal Zones** soft key gives you one focal zone.

The **Focal Zones** soft key is not available with sector transducers.

In Zoom, pressing the up arrow on the **Focal Zones** soft key adds focal zones; it does not increase the space between focal zones.

L/R Invert: Use the **L/R Invert** soft key to reverse the left/right orientation of the image. If you are in a noncardiac preset, a small open circle called a transducer orientation dot appears in the upper left corner of a noninverted image. A transducer orientation dot appears on the right of an inverted image. In cardiac presets, the location of the transducer orientation dot is reversed. **L/R Invert** is only available in live imaging and is not available when a spectral trace is live.

Map: Use the **Map** soft key to specify the postprocessing grayscale map.

In MMode and Doppler modes, the **Map** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Map is not available when a spectral trace is live.

Patient Temp: Use the **Patient Temp** soft key to enter the patient's temperature. **Patient Temp** is only available when a TEE transducer is selected.

Persist: Use the **Persist** soft key to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast moving organs or tissues and higher persistence values for slower moving organs or tissues.

Smooth: Use the **Smooth** soft key to soften or sharpen the 2D image. Higher settings make the image softer. Lower settings make the image sharper.

Trap: Use the **Trap** soft key to turn Trapezoidal Imaging on or off. Trapezoidal Imaging is available with most linear transducers. This soft key appears only in 2D Mode when a trapezoidal-capable linear transducer is selected. If you turn Trapezoidal Imaging on when you are in 2D Mode, it remains on if you switch to another mode.

Trapezoidal Imaging adds additional imaging area by changing a linear transducer's rectangular image to a trapezoidal shape. The extended field of view is often useful in vascular and small parts presets.

Trapezoidal Imaging is not available in Zoom.

U/D Invert : Use the **U/D Invert** soft key to reverse the up/down orientation of the image. A small open circle called a transducer orientation dot appears at the top of a noninverted image. An orientation dot appears on the bottom of an inverted image. **U/D Invert** is available only in live imaging and is not available with linear or TEE transducers or when a spectral trace is live.

About Fusion Settings

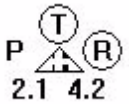
Fusion settings control the transmit and receive frequencies for the transducer. Each fusion setting is optimized for one or more of the following:

- Penetration (P)
- Texture (T)
- Resolution (R)

Fusion settings apply to 2D Mode and Tissue Harmonic Imaging. You can choose from a maximum of five fusion settings if you have an EnVisor HD or an EnVisor C HD. Otherwise, you can choose from a maximum of three settings. The number of available fusion settings depends on the transducer you are using.

Fusion Icons

A fusion icon appears on the lower left corner of the imaging screen. This icon summarizes information about the fusion setting. The following table shows examples of the icon or icons used for each imaging mode:

Mode	Icon	Description
2D Mode		The transducer is transmitting and receiving over a range of 1.6 to 4.3 MHz. The dark portion near the *T* indicates that the Fusion setting is optimized for Texture.
Tissue Harmonic Imaging		The transducer is transmitting at 1.9 MHz and is receiving at 3.8 MHz. The circle around the *R* indicates that the Fusion setting is optimized for Resolution.
		The transducer is transmitting at 2.1 MHz and is receiving at 4.2 MHz. The circles around the *T* and the *R* indicate that the Fusion setting is optimized for Texture and Resolution. This icon is used for enhanced Pulse Inversion settings that are available only with the EnVisor HD series.

Note: The transmit and receive frequencies depend on the current preset and transducer.

Resizing and Repositioning an Image

You can resize an image. If an image is not full size, you can change its position.

Resizing an Image

To resize an image:

1. Press the **Select** key until **Size** is highlighted on the bottom right corner of your imaging screen.
2. Use the trackball to change the size of the image.

Note: You cannot resize the 2D image if you are in Color Mode, Color Power Angio, or Zoom.

Repositioning an Image

To reposition an image:

1. Press the **Select** key until **Position** is highlighted on the bottom right corner of your imaging screen.
2. Use the trackball to reposition the image.

Note: Position only appears on the bottom right corner of the imaging screen if the image is not full size. You cannot reposition a full-size image.

Moving a Reference Line

A 2D reference line appears in cardiac presets, an MMode reference line appears in MMode, and a CW reference line appears in CW Doppler. To move the reference line:

1. Press the **Select** key until **Line** is highlighted on the bottom right corner of the imaging screen.
2. Use the trackball to move the reference line.

Note: The CW Doppler transmit and receive focus is indicated by a small focus diamond on the CW reference line. Use the trackball to move the CW Doppler transmit and receive focus and the reference line as one unit.

Tissue Harmonic Imaging

About Tissue Harmonic Imaging

Tissue Harmonic Imaging is a 2D Mode in which the transducer receives at twice the transmit frequency. Tissue Harmonic Imaging clears clutter from the image and can be helpful when imaging areas that are filled with fluid, such as the gallbladder or heart chambers.

Note: In Tissue Harmonic Imaging, the frame rate is generally limited to 30 Hz for the black and white image.

Using Tissue Harmonic Imaging

To use Tissue Harmonic Imaging:

1. Press the **THI** key.

A Tissue Harmonic Imaging icon like the one below appears on the lower left corner of the imaging screen:

3. Adjust the 2D GAIN rotary control and the TGC slide controls if necessary.
4. To change the appearance of your image, use the soft keys.
5. (Optional) To change the fusion setting, press the **Fusion** key.
6. To exit, press the **THI** key again.

Using Tissue Harmonic Imaging Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Biopsy: Use the **Biopsy** soft key to initiate the biopsy feature. **Biopsy** has three settings:

- **Off** – Turns the Biopsy feature off.
- **Needle** – Two guide lines appear that outline the area in which the biopsy needle path is most likely to be.
- **Gun** – One guide line appears that shows the anticipated path of the biopsy needle.

The **Biopsy** soft key is only available when you are in 2D Mode and a noncardiac preset and are using a transducer that supports biopsy.

Warnings:

- See the EnVisor Series Transducer Guide for important information about using biopsy-capable transducers.

- Biopsy guide lines are intended as guides only. Never use biopsy guide lines as an absolute reference.
- Biopsy guide lines do not take into account the possible bending of the needle.

Colorize: Use the **Colorize** soft key to assign a colorization map that replaces the gray-scale map to improve contrast resolution. The choices are **Sepia**, **Rainbow**, **Thallium**, and **Wheat**.

In MMode and Doppler Mode, the **Colorize** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Compress: Use the **Compress** soft key to adjust the compression of returning echos, which affects the grayscale display. Increasing **Compress** softens the image. Decreasing **Compress** produces a high-contrast image.

The compression setting appears on the right side of the imaging screen.

Focal Zones: Use the **Focal Zones** soft key to add focal zones. Focal zones are the areas where the image is most clearly focused. If you have an EnVisor HD or EnVisor C HD, you can choose up to eight focal zones, depending on the current imaging depth and the transducer you are using. Otherwise, you can choose up to four focal zones. If you are using Trapezoidal Imaging, you can choose no more than four focal zones. Using multiple focal zones decreases the frame rate.

Each time you press the **Focal Zones** soft key, you increase the number of focal zones or the space between them. When you reach the maximum number of focal zones, pressing the **Focal Zones** soft key gives you one focal zone.

The **Focal Zones** soft key is not available with sector transducers.

In Zoom, pressing the up arrow on the **Focal Zones** soft key adds focal zones; it does not increase the space between focal zones.

L/R Invert: Use the **L/R Invert** soft key to reverse the left/right orientation of the image. If you are in a noncardiac preset, a small open circle called a transducer orientation dot appears in the upper left corner of a noninverted image. A transducer orientation dot appears on the right of an inverted image. In cardiac presets, the location of the transducer orientation dot is reversed. **L/R Invert** is only available in live imaging and is not available when a spectral trace is live.

Map: Use the **Map** soft key to specify the postprocessing grayscale map.

In MMode and Doppler modes, the **Map** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Map is not available when a spectral trace is live.

Patient Temp: Use the **Patient Temp** soft key to enter the patient's temperature. **Patient Temp** is only available when a TEE transducer is selected.

Persist: Use the **Persist** soft key to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast moving organs or tissues and higher persistence values for slower moving organs or tissues.

Smooth: Use the **Smooth** soft key to soften or sharpen the 2D image. Higher settings make the image softer. Lower settings make the image sharper.

Trap: Use the **Trap** soft key to turn Trapezoidal Imaging on or off. Trapezoidal Imaging is available with most linear transducers. This soft key appears only in 2D Mode when a trapezoidal-capable linear transducer is selected. If you turn Trapezoidal Imaging on when you are in 2D Mode, it remains on if you switch to another mode.

Trapezoidal Imaging adds additional imaging area by changing a linear transducer's rectangular image to a trapezoidal shape. The extended field of view is often useful in vascular and small parts presets.

Trapezoidal Imaging is not available in Zoom.

U/D Invert : Use the **U/D Invert** soft key to reverse the up/down orientation of the image. A small open circle called a transducer orientation dot appears at the top of a noninverted image. An orientation dot appears on the bottom of an inverted image. **U/D Invert** is available only in live imaging and is not available with linear or TEE transducers or when a spectral trace is live.

MMode

About MMode

In MMode, you can learn about the movement of an area of anatomy. First, you position the MMode reference line in the 2D image on the anatomy of interest. Then you can display information about movement along that line in an MMode trace. An MMode trace can be helpful when you perform measurements, especially heart rate.

Note: MMode is not available with linear transducers in cardiac presets.

Using MMode

To use MMode:

1. Do one of the following:

- If you are in a noncardiac preset, press the **MMode** key to enter MMode Preview. An MMode reference line appears on the 2D image. Move the MMode reference line to the anatomy of interest with the trackball. Press the **MMode** key again or press the **Enter** key.
- If you are in a cardiac preset, move the 2D reference line to the anatomy of interest with the trackball. Press the **MMode** key.

The MMode trace appears with the 2D reference image. This is MMode Trace.

2. To change the travel speed of the scrolling trace, use the **Sweep** soft key.
3. To change the appearance of your image, use the soft keys.
4. To review the MMode trace, press the **Freeze** key, and use the trackball to scroll forward or backward.
5. To exit, press the **MMode** key or press the **2D** key.

Using MMode Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Colorize: Use the **Colorize** soft key to assign a colorization map that replaces the grayscale map to improve contrast resolution. The choices are **Sepia**, **Rainbow**, **Thallium**, and **Wheat**.

In MMode and Doppler Mode, the **Colorize** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Compress: Use the **Compress** soft key to adjust the compression of returning echos, which affects the grayscale display. Increasing **Compress** softens the image. Decreasing **Compress** produces a high-contrast image.

The compression setting appears on the right side of the imaging screen.

Focal Zones: Use the **Focal Zones** soft key to add focal zones. Focal zones are the areas where the image is most clearly focused. If you have an EnVisor HD or EnVisor C HD, you can choose up to eight focal zones, depending on the current imaging depth

and the transducer you are using. Otherwise, you can choose up to four focal zones. If you are using Trapezoidal Imaging, you can choose no more than four focal zones. Using multiple focal zones decreases the frame rate.

Each time you press the **Focal Zones** soft key, you increase the number of focal zones or the space between them. When you reach the maximum number of focal zones, pressing the **Focal Zones** soft key gives you one focal zone.

The **Focal Zones** soft key is not available with sector transducers.

In Zoom, pressing the up arrow on the **Focal Zones** soft key adds focal zones; it does not increase the space between focal zones.

Map: Use the **Map** soft key to specify the postprocessing grayscale map.

In MMode and Doppler modes, the **Map** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Map is not available when a spectral trace is live.

Patient Temp: Use the **Patient Temp** soft key to enter the patient's temperature. **Patient Temp** is only available when a TEE transducer is selected.

Persist: Use the **Persist** soft key to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast moving organs or tissues and higher persistence values for slower moving organs or tissues.

Smooth: Use the **Smooth** soft key to soften or sharpen the 2D image. Higher settings make the image softer. Lower settings make the image sharper.

Sweep: Use the **Sweep** soft key to control the travel speed of the scrolling trace. **Sweep** is only available when the trace is live.

About the Scrolling of the MMode Trace

You can control whether the MMode trace is scrolling or nonscrolling.

- Scrolling trace — While the trace is live, it moves from right to left, with new data appearing at the right margin.
- Nonscrolling trace — An erase bar slides from left to right across the trace, with new data appearing just to the left of the erase bar.

Controlling the Scrolling of the MMode Trace

To control the MMode trace:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Mode** tab.

   The **Mode** window opens.

3. For a scrolling trace, select the **Scrolling Trace** check box.

   For a nonscrolling trace, clear the **Scrolling Trace** check box.

4. Click **Apply**.

5. Click **Close**.

About the MMode Format

You can specify the format of the MMode display, which is how the MMode trace and the 2D reference image appear on the imaging screen. You have three options:

- **Small over large** — The small 2D reference image appears above the large MMode trace.
- **Side by side** — The MMode trace and the 2D reference image appear next to each other.
- **Full screen** — A full-screen MMode trace appears. A very small reference image appears in the corner.

Changing the MMode Format

To change the MMode format:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Mode** tab.

   The **Mode** window opens.

3. Select an MMode format option:

- Small over large
- Side by side
- Full screen

4. Click **Apply**.
5. Click **Close**.

Color MMode

About Color MMode

You are in Color MMode when you are in Color Mode and MMode at the same time. In Color MMode, a color box appears on the 2D reference image, and information about color flow along the entire MMode reference line appears in the MMode trace. The position of the color box in the 2D reference image does not affect the color information displayed in the MMode trace.

Using Color MMode

To use Color MMode:

1. Press the **Color** key.
2. Do one of the following:

- If you are in a noncardiac preset, press the **MMode** key to enter Color MMode Preview. An MMode reference line appears on the 2D image. Move the MMode reference line to the anatomy of interest with the trackball. Press the **MMode** key again or press the **Enter** key.
- If you are in a cardiac preset, move the 2D reference line to the anatomy of interest with the trackball. Press the **MMode** key.

  The MMode trace appears with the 2D reference image. This is Color MMode Trace. Information about color flow along the entire MMode reference line appears in the MMode trace.

3. (Optional) To change the travel speed of the scrolling trace, use the **Sweep** soft key.

4. (Optional) To change the appearance of your image, use the soft keys.
5. (Optional) To review the MMode trace, press the **Freeze** key, and use the trackball to scroll forward or backward.
6. To exit, press the **MMode** key or the **2D** key.

Note: If you want, you can press the **MMode** key before pressing the **Color** key.

Using Color MMode Soft Keys

The soft keys available to you depend on the term that is highlighted on the bottom right corner of the imaging screen.

- MMode soft keys appear when **Line** is highlighted.
- Color Mode soft keys appear when **Size** or **Position** is highlighted.

MMode Zoom

About MMode Zoom

When you are in MMode, you can magnify a portion of the reference image by entering MMode Zoom.

In MMode Zoom, the MMode trace represents only the information in the zoom box.

Using MMode Zoom

- To use MMode Zoom, press the **MMode** key twice and the **Zoom** key twice. You can press these keys in any order.
- The first time you press the **MMode** key, you enter MMode Preview. Move the MMode reference line to the anatomy of interest with the trackball.
- The second time you press the **MMode** key, the MMode trace appears with the reference image.

  Note: If you are in a cardiac preset, the MMode trace appears the first time you press the **MMode** key.
- The first time you press the **Zoom** key, a zoom box appears on the image. Change the size and position of the zoom box with the trackball so that the zoom box contains the area that you want to magnify.

- The second time you press the **Zoom** key, the magnified area appears.

To exit MMode but remain in Zoom, press the **MMode** key.

To exit Zoom but remain in MMode, press the **Zoom** key.

To exit MMode Zoom, press the **2D** key or the **MMode** and **Zoom** keys.

PW Doppler

About PW Doppler

Pulsed Wave (PW) Doppler is a Doppler mode that measures velocity in a sample volume gate and displays that information in a spectral trace with audio output.

Note: PW Doppler is only available with transducers that support PW Doppler.

Using PW Doppler

To use PW Doppler:

1. Press the **PW** key.

   A PW cursor line and an angle-to-flow arrow appear on the 2D image. The PW sample volume gate lies on the PW cursor line. This is PW Doppler Preview.
2. Place the PW sample volume gate in the center of the vessel with the trackball.
3. Adjust the width of the PW sample volume gate with the **Gate** soft key if necessary.
4. Press the **Spectral** key, the **Enter** key, or the **PW** key.

   A PW spectral trace appears with a 2D reference image. This is PW Spectral Doppler.
5. Adjust the volume of the Doppler audio with the **Volume** rotary control if necessary.
6. Adjust the angle-to-flow arrow with the **Angle** rotary control if necessary.
7. Adjust the spectrum with the Doppler **Gain**, **Scale**, and **Baseline** rotary controls if necessary.
8. Use the soft keys to optimize the spectral trace.

9. To control whether the 2D reference image or the PW spectral trace is live, press the **Spectral** key or the **Enter** key. The soft keys affect the element that is live.
10. To scroll the spectral trace, press the **Freeze** key and use the trackball to scroll forward or backward.
11. To exit PW Doppler, press the **2D** key, the **MMode** key, or the **PW** key.

Note: If you press the **Spectral** key when you are in 2D Mode, you enter PW Spectral Doppler.

Using PW Doppler Soft Keys

These are the soft keys that may be available to you in PW Doppler Preview or PW Spectral Doppler.

To change any of the settings listed below, press the oval key below the soft key label.

Audio: Use the **Audio** soft key to turn Doppler audio on or off. **Audio** is only available in PW Doppler Preview.

Colorize: Use the **Colorize** soft key to assign a colorization map that replaces the grayscale map to improve contrast resolution. The choices are **Sepia**, **Rainbow**, **Thallium**, and **Wheat**.

In MMode and Doppler Mode, the **Colorize** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Compress: In CW or PW Doppler Preview, use the **Compress** soft key to adjust the compression of returning echos, which affects the grayscale display. Increasing **Compress** softens the image. Decreasing **Compress** produces a high-contrast image.

In CW or PW Spectral Doppler, use the **Compress** soft key to adjust the dynamic range, or compression, of the Doppler signals that appear. Higher compression makes the trace look softer; lower compression gives the trace more contrast.

Delay: Use the **Delay** soft key to specify the delay (in milliseconds) from the time the R-wave occurs until the reference image is updated. It is available only when an ECG trace appears on the imaging screen and the spectral trace is live. It is not available in Duplex or Triplex or with a nonimaging transducer.

If you do not want the reference image to be updated, press the up arrow on the **Delay** soft key repeatedly and choose the **2D Hold On** setting.

Filter: Use the **Filter** soft key to remove audible signals and Doppler displays of frequencies below the selected level. **Filter** is only available when the spectral trace is live.

Focal Zones: Use the **Focal Zones** soft key to add focal zones. Focal zones are the areas where the image is most clearly focused. If you have an EnVisor HD or EnVisor C HD, you can choose up to eight focal zones, depending on the current imaging depth and the transducer you are using. Otherwise, you can choose up to four focal zones. If you are using Trapezoidal Imaging, you can choose no more than four focal zones. Using multiple focal zones decreases the frame rate.

Each time you press the **Focal Zones** soft key, you increase the number of focal zones or the space between them. When you reach the maximum number of focal zones, pressing the **Focal Zones** soft key gives you one focal zone.

The **Focal Zones** soft key is not available with sector transducers.

In Zoom, pressing the up arrow on the **Focal Zones** soft key adds focal zones; it does not increase the space between focal zones.

Frequency: Use the **Frequency** soft key to specify the transducer frequency used for color, angio, or Doppler data. The **Frequency** soft key is available only for transducers with multiple flow or Doppler frequencies.

The **Adaptive Flow** setting is available for some transducers if you have an EnVisor HD or an EnVisor C HD. **Adaptive Flow** changes the flow frequency to an optimal frequency for that transducer for the selected focal zone. **Adaptive Flow** is only available in Color Mode and Color Power Angio.

In PW Doppler, the **Frequency** soft key is only available when the spectral trace is live.

Gate: Use the **Gate** soft key to adjust the width of the PW sample volume gate.

L/R Invert: Use the **L/R Invert** soft key to reverse the left/right orientation of the image. If you are in a noncardiac preset, a small open circle called a transducer orientation dot appears in the upper left corner of a noninverted image. A transducer orientation dot appears on the right of an inverted image. In cardiac presets, the location of the transducer orientation dot is reversed. **L/R Invert** is only available in live imaging and is not available when a spectral trace is live.

Map: Use the **Map** soft key to specify the postprocessing grayscale map.

In MMode and Doppler modes, the **Map** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Map is not available when a spectral trace is live.

Patient Temp: Use the **Patient Temp** soft key to enter the patient's temperature. **Patient Temp** is only available when a TEE transducer is selected.

Persist: Use the **Persist** soft key to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast moving organs or tissues and higher persistence values for slower moving organs or tissues. **Persist** is not available when a spectral trace is live.

Reject: Use the **Reject** soft key to darken background noise in the spectrum. Increase **Reject** for strong Doppler signals; decrease **Reject** for weak signals.

Smooth: Use the **Smooth** soft key to change the appearance of the Doppler spectrum. Smooth has eight settings. Generally, lower settings provide a softer, smoother, vertically brushed texture, and higher settings provide a sharper, dot-like texture.

Spectral Invert: Use the **Spectral Invert** soft key to invert the spectral display so that positive values (representing blood movement toward the transducer) are shown beneath the Doppler baseline and negative values (representing blood movement away from the transducer) are shown above. **Spectral Invert** also swaps the stereo audio channels. **Spectral Invert** is only available when the spectral trace is live.

Steer: Use the **Steer** soft key to specify the PW cursor line angle for linear transducers.

- When **Left** or **Right** is selected, the PW sample gate position is restricted to a subset of the full image area determined by the PW cursor line angle.
- When **Center** is selected, the PW cursor line runs vertically through the Doppler gate.
- When **Auto** is selected, Intelligent Doppler is on. This automatically moves the PW cursor line, whenever the angle-to-flow arrow is moved, to maintain an optimum cursor angle between the angle-to-flow arrow and the direction of blood flow.

Sweep: Use the **Sweep** soft key to control the travel speed of the ECG or the auxiliary trace.

U/D Invert : Use the **U/D Invert** soft key to reverse the up/down orientation of the image. A small open circle called a transducer orientation dot appears at the top of a noninverted image. An orientation dot appears on the bottom of an inverted image. **U/D Invert** is available only in live imaging and is not available with linear or TEE transducers or when a spectral trace is live.

Update: Use the **Update** soft key to specify how often (in 500-millisecond increments from 500 to 7000 milliseconds) the reference image is updated. **Update** is available only when no ECG trace appears on the imaging screen and the spectral trace is live. It is not available in Duplex or Triplex or with a nonimaging transducer.

If you do not want the reference image to be updated, press the up arrow on the **Update** soft key repeatedly and choose the **2D Hold On** setting.

Waveform: Use the **Waveform** soft key to display or hide an outline of the maximum and mean of a PW spectral trace. The **Waveform** soft key is only available when the spectral trace is frozen.

Note: If you are in Color PW Doppler or Color Power Angio PW Doppler, the soft keys available to you depend on the term that is highlighted on the bottom right corner of the imaging screen.

- PW Doppler soft keys appear when **Gate** is highlighted.
- Color Mode soft keys or Color Power Angio soft keys appear when Size or Position is highlighted.

Repositioning the PW Sample Volume Gate

To reposition the PW sample volume gate:

1. Press the **Select** key until **Gate** is highlighted on the bottom right corner of your imaging screen.
2. Use the trackball to reposition the PW sample volume gate.

Turning Adaptive Doppler On or Off

Adaptive Doppler reduces the background noise in the spectral trace and in the audio. If you have an EnVisor HD or an EnVisor C HD, Adaptive Doppler is turned on by default.

Note: Adaptive Doppler is only available on the EnVisor HD series.

To turn Adaptive Doppler on or off:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Mode** tab.

   The **Mode** window opens.

3. To turn Adaptive Doppler on, select the **Adaptive Doppler** check box.

   To turn Adaptive Doppler off, clear the **Adaptive Doppler** check box.

4. Click **Apply**.

5. Click **Close**.

Turning Intelligent Doppler On or Off

When Intelligent Doppler is on, turning the **Angle** rotary control moves the PW cursor line, whenever the angle-to-flow arrow is moved, to maintain an optimum cursor angle between the angle-to-flow arrow and the direction of blood flow.

To specify the optimum cursor angle, press the **Setup** key, click the **Mode** tab, and click the optimum cursor angle.

Note: Intelligent Doppler is only available in PW Doppler and on linear transducers.

To turn on Intelligent Doppler, press the **Steer** soft key and choose the **Auto** setting.

Changing Doppler Settings

You can change two Doppler settings:

- **Optimum cursor angle** — The angle the system tries to maintain between the PW cursor line and the direction of blood flow when Intelligent Doppler is on
- **Doppler scale units** — The units in which the Doppler spectrum is measured

To change Doppler settings:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Mode** tab.

   The **Mode** window opens.

3. For PW Doppler, specify an **Optimum cursor angle** setting. The choices are **0**, **50**, 55, **60**, and **65** degrees.

4. Specify the **Doppler scale units**. Your options are **m/s**, **kHz**, and **cm/s**.

   Note: If you choose **m/s** or **cm/s**, the spectrum is measured as a velocity. If you choose **kHz**, the spectrum is measured as a frequency.

5. Click **Apply**.

6. Click **Close**.

About the Scrolling of the Spectral Trace

You can control whether the spectral trace is scrolling or nonscrolling.

- Scrolling trace — While the trace is live, it moves from right to left, with new data appearing at the right margin.
- Nonscrolling trace — An erase bar slides from left to right across the trace, with new data appearing just to the left of the erase bar.

Controlling the Scrolling of the Spectral Trace

To control the spectral trace:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Mode** tab.

   The **Mode** window opens.

3. For a scrolling trace, select the **Scrolling Trace** check box.

   For a nonscrolling trace, clear the **Scrolling Trace** check box.

4. Click **OK**.

About the Spectral Trace Format

You can specify the format of the Doppler display, which is how the spectral trace and the 2D reference image appear on the imaging screen. You have four options:

- **Small over large** — The small 2D reference image appears above the large Doppler trace.
- **Large over small** — The large 2D reference image appears above the small Doppler trace.
- **Side by side** — The Doppler trace and the reference image appear next to each other.
- **Full screen** — A full-screen Doppler trace appears. A very small reference image appears in the corner.

Changing the Spectral Trace Format

To change the spectral trace format:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Mode** tab.

   The **Mode** window opens.

3. Select a spectral trace format:

- Small over large
- Large over small
- Side by side
- Full screen

4. Click **Apply**.

5. Click **Close**.

CW Doppler

About CW Doppler

Continuous Wave (CW) Doppler is a Doppler mode that measures velocity along a Doppler line and displays that information in a spectral trace with audio output.

Note: CW Doppler is only available with transducers that support CW Doppler.

Using CW Doppler

To use CW Doppler:

1. Do one of the following:

- If you are in a noncardiac preset, press the **CW** key. A CW reference line appears on the 2D image. This is CW Doppler Preview.
- If you are in a cardiac preset, you do not need to press the **CW** key. A 2D reference line appears on the 2D image.

2. Move the focus diamond on the reference line to the anatomy of interest with the trackball.
3. Press the **CW** key. From CW Doppler Preview, you can alternatively press the **Enter** key or the **Spectral** key.

   A CW spectral trace appears with a 2D reference image. This is CW Spectral Doppler.
4. To change the appearance of your image, use the soft keys.
5. To scroll the spectral trace, press the **Select** key until **Trace** is highlighted on the bottom right corner of the imaging screen. Press the **Freeze** key and use the trackball to scroll forward or backward.
6. To specify whether the 2D reference image or the CW spectral trace is live, press the **Spectral** key or the **Enter** key. The soft keys affect the element that is live.
7. To exit CW Doppler, press the **2D** key, the **MMode** key, or the **PW** key.

Note: If you press the **Spectral** key when you are in 2D Mode, you enter PW Spectral Doppler.

Using CW Doppler Soft Keys

These are the soft keys that may be available to you in CW Doppler Preview or CW Spectral Doppler. The soft keys affect either 2D reference image or the CW spectral trace, whichever is live.

To change any of the settings listed below, press the oval key below the soft key label.

Colorize: Use the **Colorize** soft key to assign a colorization map that replaces the gray-scale map to improve contrast resolution. The choices are **Sepia**, **Rainbow**, **Thallium**, and **Wheat**.

In MMode and Doppler Mode, the **Colorize** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Compress: In CW or PW Doppler Preview, use the **Compress** soft key to adjust the compression of returning echos, which affects the grayscale display. Increasing **Compress** softens the image. Decreasing **Compress** produces a high-contrast image.

In CW or PW Spectral Doppler, use the **Compress** soft key to adjust the dynamic range, or compression, of the Doppler signals that appear. Higher compression makes the trace look softer; lower compression gives the trace more contrast.

Delay: Use the **Delay** soft key to specify the delay (in milliseconds) from the time the R-wave occurs until the reference image is updated. It is available only when an ECG trace appears on the imaging screen and the spectral trace is live. It is not available in Duplex or Triplex or with a nonimaging transducer.

If you do not want the reference image to be updated, press the up arrow on the **Delay** soft key repeatedly and choose the **2D Hold On** setting.

Filter: Use the **Filter** soft key to remove audible signals and Doppler displays of frequencies below the selected level. **Filter** is only available when the spectral trace is live.

Focal Zones: Use the **Focal Zones** soft key to add focal zones. Focal zones are the areas where the image is most clearly focused. If you have an EnVisor HD or EnVisor C HD, you can choose up to eight focal zones, depending on the current imaging depth and the transducer you are using. Otherwise, you can choose up to four focal zones. If you are using Trapezoidal Imaging, you can choose no more than four focal zones. Using multiple focal zones decreases the frame rate.

Each time you press the **Focal Zones** soft key, you increase the number of focal zones or the space between them. When you reach the maximum number of focal zones, pressing the **Focal Zones** soft key gives you one focal zone.

The **Focal Zones** soft key is not available with sector transducers.

In Zoom, pressing the up arrow on the **Focal Zones** soft key adds focal zones; it does not increase the space between focal zones.

L/R Invert: Use the **L/R Invert** soft key to reverse the left/right orientation of the image. If you are in a noncardiac preset, a small open circle called a transducer orientation dot appears in the upper left corner of a noninverted image. A transducer orientation dot appears on the right of an inverted image. In cardiac presets, the location of the transducer orientation dot is reversed. **L/R Invert** is only available in live imaging and is not available when a spectral trace is live.

Map: Use the **Map** soft key to specify the postprocessing grayscale map.

In MMode and Doppler modes, the **Map** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Map is not available when a spectral trace is live.

Patient Temp: Use the **Patient Temp** soft key to enter the patient's temperature. **Patient Temp** is only available when a TEE transducer is selected.

Persist: Use the **Persist** soft key to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast moving organs or tissues and higher persistence values for slower moving organs or tissues. **Persist** is not available when a spectral trace is live.

Reject: Use the **Reject** soft key to darken background noise in the spectrum. Increase **Reject** for strong Doppler signals; decrease **Reject** for weak signals.

Smooth: Use the **Smooth** soft key to change the appearance of the Doppler spectrum. Smooth has eight settings. Generally, lower settings provide a softer, smoother, vertically brushed texture, and higher settings provide a sharper, dot-like texture.

Spectral Invert: Use the **Spectral Invert** soft key to invert the spectral display so that positive values (representing blood movement toward the transducer) are shown beneath the Doppler baseline and negative values (representing blood movement away from the transducer) are shown above. **Spectral Invert** also swaps the stereo audio channels. **Spectral Invert** is only available when the spectral trace is live.

Sweep: Use the **Sweep** soft key to control the travel speed of the ECG or the auxiliary trace.

U/D Invert : Use the **U/D Invert** soft key to reverse the up/down orientation of the image. A small open circle called a transducer orientation dot appears at the top of a noninverted image. An orientation dot appears on the bottom of an inverted image. **U/D Invert** is available only in live imaging and is not available with linear or TEE transducers or when a spectral trace is live.

Update: Use the **Update** soft key to specify how often (in 500-millisecond increments from 500 to 7000 milliseconds) the reference image is updated. **Update** is available only when no ECG trace appears on the imaging screen and the spectral trace is live. It is not available in Duplex or Triplex or with a nonimaging transducer.

If you do not want the reference image to be updated, press the up arrow on the **Update** soft key repeatedly and choose the **2D Hold On** setting.

Note: If you are in Color CW Doppler or Color Power Angio CW Doppler, the soft keys available to you depend on the term that is highlighted on the bottom right corner of the imaging screen.

- CW Doppler soft keys appear when **Line** is highlighted.
- Color Mode soft keys or Color Power Angio soft keys appear when **Size** or **Position** is highlighted.

About Nonimaging CW Doppler

If you are using a nonimaging transducer that supports CW Doppler, you are automatically in CW Spectral Doppler. You do not need to press the **CW** key. When you use a nonimaging transducer, no reference image appears.

Note: The **Spectral** key is inactive when you are using a nonimaging transducer.

Duplex and Triplex

About Duplex and Triplex

Duplex enables you to simultaneously display a live 2D image and a PW Doppler spectral trace. Triplex enables you to simultaneously display a live 2D image with color or angio and a PW Doppler trace.

Notes:

- Duplex and Triplex are only available with transducers that support PW Doppler.
- Duplex and Triplex are not available with cardiac presets.
- Being in Duplex and Triplex limits the Doppler pulse repetition frequency (PRF), which limits the maximum velocity of blood flow that can be measured without aliasing. When you are in Duplex or Triplex, the displayed velocity scale may automatically be reduced.

Using Duplex

Duplex enables you to simultaneously display a live 2D image and a PW Doppler spectral trace.

To use Duplex:

1. While in 2D Mode, CW Doppler, or PW Doppler, press the **Plex** key.
2. Do one of the following:

- To exit Duplex but remain in spectral Doppler, press the **Plex** key again.
- To exit spectral Doppler, press the key for any imaging mode.

Note: If you are in Duplex and you press the **Color** or **Angio** key, you enter Triplex.

Using Triplex

Triplex enables you to simultaneously display a live 2D image with color or angio and a PW Doppler trace.

To use Triplex:

1. While in CW Doppler or PW Doppler, press the **Color** or **Angio** key.
2. Press the **Plex** key.
3. Do one of the following:

- To exit Triplex but remain in spectral Doppler, press the **Plex** key again.
- To exit spectral Doppler, press the key for any imaging mode.

Note: If you are in Triplex and you press the **Color** or **Angio** key, you enter Duplex.

Using Duplex and Triplex Soft Keys

The soft keys available to you depend on the term that is highlighted on the bottom right corner of the imaging screen.

- In Duplex, PW Doppler soft keys always appear.
- In Triplex, PW Doppler soft keys appear when **Gate** is highlighted.
- In Triplex, Color Mode soft keys or Color Power Angio soft keys appear when **Size** or **Position** is highlighted.

Tissue Doppler

About Tissue Doppler

Tissue Doppler optimizes settings to measure the movement of tissue using color Doppler.

Before you use Tissue Doppler, you need to assign one of the option keys to Tissue Doppler.

Note: Tissue Doppler is only available on the EnVisor HD series and with cardiac presets. Tissue Doppler is not available with all transducers.

Using Tissue Doppler

To use Tissue Doppler, press the Tissue Doppler option key.

To exit, press the key for any other mode.

Tissue Doppler Soft Keys

The Tissue Doppler soft keys are the same as the Color Mode soft keys.

Color Mode

About Color Mode

In Color Mode, a color box appears on the image. The velocity and direction of flow in the color box are represented with different colors for direction and different shades for velocity. The colors being used appear in the color bar in the upper right corner of the imaging screen.

Turning on Color Mode turns off Color Power Angio, but does not turn off MMode, PW Doppler, or CW Doppler.

Using Color Mode

To use Color Mode:

1. In 2D Mode, optimize the image.
2. Resize and reposition the 2D image if necessary.
3. To start Color Mode, press the **Color** key.

   A color box appears on the image.
4. Resize and reposition the color box with the trackball if necessary.
5. Adjust the **Baseline**, **Doppler Gain**, and **Scale** rotary controls if necessary.
6. To change the appearance of your image, use the soft keys.
7. (Optional) If you're using a linear transducer, use the **Angle** rotary control to steer the color box.
8. To exit, press the **Color** key again or press the **2D** key.

Using Color Mode Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

B/W Suppress: Use the **B/W Suppress** soft key to force the width and position of the 2D image to match the width and position of the color or angio window. Reducing the size of the window increases the frame rate. **B/W Suppress** is available only with sector and curved linear transducers.

Density: Use the **Density** soft key to specify the number of color or angio interrogation lines. Use **Density** in conjunction with the **Packet** soft key.

Increasing **Density** decreases the frame rate.

Decreasing **Density** increases the frame rate.

Filter: Use the **Filter** soft key to remove extraneous color information due to tissue motion rather than blood flow.

Increasing **Filter** decreases low-velocity information and noise.

Decreasing **Filter** increases sensitivity to low-velocity information.

Frequency: Use the **Frequency** soft key to specify the transducer frequency used for color, angio, or Doppler data. The **Frequency** soft key is available only for transducers with multiple flow or Doppler frequencies.

The **Adaptive Flow** setting is available for some transducers if you have an EnVisor HD or an EnVisor C HD. **Adaptive Flow** changes the flow frequency to an optimal frequency for that transducer for the selected focal zone. **Adaptive Flow** is only available in Color Mode and Color Power Angio.

In PW Doppler, the **Frequency** soft key is only available when the spectral trace is live.

Map: Use the **Map** soft key to change the set of color hues that are mapped to the range of flow amplitudes. Map **F** represents Directional Angio, which uses two different hues to indicate blood flow amplitude toward and away from the transducer.

Map Invert: Use the **Map Invert** soft key to reverse the colors that represent flow direction, switching from the BART (Blue-Away, Red-Toward) format when **Map Invert** is off to the RABT (Red-Away, Blue-Toward) format when **Map Invert** is on.

Map Invert is only available in Color Power Angio when Directional Angio is on. To turn on Directional Angio, select map **F** with the **Map** soft key. **Map Invert** is always available in Color Mode.

Packet: Use the **Packet** soft key to specify the flow packet size, which determines the number of times each color or angio scan line is interrogated.

Increasing **Packet** increases color or angio sensitivity and decreases the frame rate.

Decreasing **Packet** decreases color or angio sensitivity and increases the frame rate.

Patient Temp: Use the **Patient Temp** soft key to enter the patient's temperature. **Patient Temp** is only available when a TEE transducer is selected.

Increasing **Persist** increases color or angio filling and decreases noise.**Persist:** Use the **Persist** soft key to average consecutive frames for a smoother appearance with less noise. Increasing **Persist** smooths the color or angio appearance.

Decreasing **Persist** decreases color or angio filling and increases noise.

Smooth: Use the **Smooth** soft key to change the appearance of the flow data by using spatial filtering. There are eight **Smooth** settings. Use lower settings for smaller vessels and higher **Smooth** settings for larger vessels.

Using Color Suppress

Color Suppress temporarily removes color data from a frozen color image without exiting Color Mode.

To use Color Suppress:

1. While in Color Mode, press the **Freeze** key to freeze the image.
2. Press the **Color** key.

   Color data is removed from the image.
3. Press the **Color** key again to bring color data back to the frozen image.
4. Press the **Freeze** key to return to live imaging.

Color Compare

About Color Compare

Color Compare shows color flow on the right-hand image and a flow-suppressed version of the same image on the left. Both images are live.

Color Compare is a type of Dual Imaging.

Using Color Compare

To use Color Compare:

1. While you are viewing a live image in Color Mode, press the **Left** or the **Right** key.

   Two images appear: an image that shows color flow on the right and a flow-suppressed version of the same image on the left.
2. (Optional) To transition to Dual Imaging without Color Compare, press the **Left** or the **Right** key again.
3. To exit, press the **2D** key.

Color Power Angio

About Color Power Angio

In Color Power Angio, an angio box appears on the image. The amplitude (intensity) of flow in the angio box is represented with different hues. The colors being used appear in the color bar on the upper right corner of the imaging screen.

Turning on Color Power Angio turns off Color Mode, but does not turn off MMode, PW Doppler, or CW Doppler.

Using Color Power Angio

To use Color Power Angio:

1. In 2D Mode, optimize the image.
2. Resize and reposition the 2D image if necessary.
3. Press the **Angio** key to enter Color Power Angio.

   An angio box appears on the image.
4. Resize and reposition the angio box with the trackball if necessary.
5. Adjust the **Baseline**, **Doppler Gain**, and **Scale** rotary controls if necessary.
6. (Optional) To change the appearance of your image, use the soft keys.
7. (Optional) If you're using a linear transducer, use the **Angle** rotary control to steer the angio box.
8. To exit, press the **Angio** key or press the **2D** key.

Using Color Power Angio Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

B/W Suppress: Use the **B/W Suppress** soft key to force the width and position of the 2D image to match the width and position of the color or angio window. Reducing the size of the window increases the frame rate. **B/W Suppress** is available only with sector and curved linear transducers.

Density: Use the **Density** soft key to specify the number of color or angio interrogation lines. Use **Density** in conjunction with the **Packet** soft key.

Increasing **Density** decreases the frame rate.

Decreasing **Density** increases the frame rate.

Filter: Use the **Filter** soft key to remove extraneous color information due to tissue motion rather than blood flow.

Increasing **Filter** decreases low-velocity information and noise.

Decreasing **Filter** increases sensitivity to low-velocity information.

Frequency: Use the **Frequency** soft key to specify the transducer frequency used for color, angio, or Doppler data. The **Frequency** soft key is available only for transducers with multiple flow or Doppler frequencies.

The **Adaptive Flow** setting is available for some transducers if you have an EnVisor HD or an EnVisor C HD. **Adaptive Flow** changes the flow frequency to an optimal frequency for that transducer for the selected focal zone. **Adaptive Flow** is only available in Color Mode and Color Power Angio.

In PW Doppler, the **Frequency** soft key is only available when the spectral trace is live.

Map: Use the **Map** soft key to change the set of color hues that are mapped to the range of flow amplitudes. Map **F** represents Directional Angio, which uses two different hues to indicate blood flow amplitude toward and away from the transducer.

Map Invert: Use the **Map Invert** soft key to reverse the colors that represent flow direction, switching from the BART (Blue-Away, Red-Toward) format when **Map Invert** is off to the RABT (Red-Away, Blue-Toward) format when **Map Invert** is on.

Map Invert is only available in Color Power Angio when Directional Angio is on. To turn on Directional Angio, select map **F** with the **Map** soft key. **Map Invert** is always available in Color Mode.

Packet: Use the **Packet** soft key to specify the flow packet size, which determines the number of times each color or angio scan line is interrogated.

Increasing **Packet** increases color or angio sensitivity and decreases the frame rate.

Decreasing **Packet** decreases color or angio sensitivity and increases the frame rate.

Patient Temp: Use the **Patient Temp** soft key to enter the patient's temperature. **Patient Temp** is only available when a TEE transducer is selected.

Persist: Use the **Persist** soft key to average consecutive frames for a smoother appearance with less noise. Increasing **Persist** smooths the color or angio appearance.

Increasing **Persist** increases color or angio filling and decreases noise.

Decreasing **Persist** decreases color or angio filling and increases noise.

Smooth: Use the **Smooth** soft key to change the appearance of the flow data by using spatial filtering. There are eight **Smooth** settings. Use lower settings for smaller vessels and higher **Smooth** settings for larger vessels.

Using Color Power Angio Suppress

Color Power Angio Suppress temporarily removes angio data from a frozen angio image without exiting Color Power Angio.

To use Color Power Angio Suppress:

1. While in Color Power Angio, press the **Freeze** key to freeze the image.
2. Press the **Angio** key.

   Angio data is removed from the image.
3. Press the **Angio** key again to bring angio data back to the frozen image.
4. Press the **Freeze** key to return to live imaging.

Color Power Angio Compare

About Color Power Angio Compare

Color Power Angio Compare shows angio flow on the right-hand image and a flow-suppressed version of the same image on the left. Both images are live.

Color Power Angio Compare is a type of Dual Imaging.

Using Color Power Angio Compare

To use Color Power Angio Compare:

1. While you are viewing a live image in Color Power Angio, press the **Left** or the **Right** key.

Two images appear: an image that shows angio flow on the right and a flow-suppressed version of the same image on the left.

2. (Optional) To transition to Dual Imaging without Angio Compare, press the **Left** or the **Right** key again.
3. To exit, press the **2D** key.

3D Mode

About 3D Mode

In 3D Mode, you acquire a series of 2D images, called the 3D dataset. Information from this dataset is used to create a lifelike 3D image. The image is static and appears in grayscale.

To use 3D Mode, you must first acquire the 3D dataset. You can then review and edit the 3D image. You may also view an animated display, or movie, of the 3D image.

Before You Use 3D Mode

Before you use 3D Mode, you need to assign one of the option keys to 3D Mode.

Notes:

- 3D Mode is a component of the OB/GYN application-package option.
- 3D Mode does not support up/down inverted images. Up/down inverted images appear uninverted in 3D Mode.
- Pressing the 3D option key in any mode other than 3D turns off all other modes and switches to 3D. Pressing the 3D option key during any 3D stage exits 3D Mode.

Helpful Hints for 3D Mode

- If you want to view the fetal face, use the Map, **Compress**, and **Smooth** soft keys to set the image contrast such that the fetal face has a high contrast against the surrounding tissue before you acquire the 3D dataset.
- Before you acquire the 3D dataset, decrease the **Persist** soft key for higher spatial resolution, especially for fast movements during the scan. Increase the **Persist** soft key for smoother appearance.

- When you are reviewing a rendered 3D image, press the **Render Mode** soft key to choose **MaxIP** to find the silhouette of the fetal face, and use the Trim tool to sculpt away surrounding tissue.
- When you are reviewing a rendered 3D image, press the **Render Mode** soft key to choose **X-Ray** to display bones, such as the spine of the fetus.

Acquiring a 3D Dataset

Before you use 3D Mode, you must assign an option key to 3D Mode.

When you use 3D Mode, you must first acquire a series of 2D images, called the 3D dataset.

To acquire the 3D dataset:

1. Press the 3D option key to start 3D Mode.
2. Optimize the image.
3. Use the soft keys to change the appearance of your image.
4. To specify the scanning method, press the **Scan Geometry** soft key.
5. To specify the scanning direction, press the **Scan Direction** soft key.
6. To set the scanning length or angle, press the **Scan Length** or the **Scan Angle** soft key.
7. Begin moving the transducer using the method specified by the **Scan Geometry** soft key at a constant speed.

   Note: Be sure to scan in the direction specified by the **Scan Direction** soft key and to use the method specified by the **Scan Geometry** soft key.
8. Press the **Acquire** key or use the foot switch to begin acquiring the 3D dataset.
9. If you decide not to complete the acquisition, press the **Cancel Acquire** soft key.
10. To complete the acquisition of the 3D dataset, press the **Acquire** key again. Imaging automatically stops if the maximum number of frames are acquired.

    The 3D image is displayed on the imaging screen so that you can view or edit the image.

Defining a 3D Region of Interest

To define a region of interest for a 3D image, press the **ROI** soft key. If necessary, change the size and the position of the region of interest box.

To remove the region of interest box, press the **ROI** soft key again.

Using 3D Dataset-Acquisition Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Cancel Acquire: Use the **Cancel Acquire** soft key to discontinue the acquisition of a 3D dataset so that you can modify imaging parameters.

Compress: Use the **Compress** soft key to adjust the compression of returning echos, which affects the grayscale display. Increasing **Compress** softens the image. Decreasing **Compress** produces a high-contrast image.

Map: Use the **Map** soft key to specify the postprocessing grayscale map.

In MMode and Doppler modes, the **Map** soft key affects the spectrum when **Trace** is highlighted on the bottom right corner of the imaging screen. It affects the reference image when **Image** is highlighted.

Map is not available when a spectral trace is live.

Persist: Use the **Persist** soft key to average consecutive frames to provide a smoother appearance with less noise. Use lower persistence values for fast moving organs or tissues and higher persistence values for slower moving organs or tissues.

ROI: Use the **ROI** soft key to define a region of interest (a subregion of the image) to be used when creating the 3D image. When **ROI** is on, you can change the size and the position of the region of interest box with the trackball. When **ROI** is off, the 3D dataset is created from the entire image.

Scan Angle: When the **Scan Geometry** soft key setting is **Fan**, use the **Scan Angle** soft key to specify the approximate angle you will tilt the transducer during the acquisition of the 3D dataset.

Scan Length: When the **Scan Geometry** soft key setting is **Linear**, use the **Scan Length** soft key to specify the approximate distance that you will move the transducer during the acquisition of the 3D dataset.

Scan Direction: Use the **Scan Direction** soft key to specify the direction the transducer will move during the acquisition of the dataset: **L to R** (left to right) or **R to L** (right to left).

Scan Geometry: Use the **Scan Geometry** soft key to specify how you will move the transducer during the acquisition of the dataset. **Linear** indicates that you will move the transducer in a straight line. **Fan** indicates that you will hold the transducer in one place and tilt it from one side to the other.

Smooth: Use the **Smooth** soft key to soften or sharpen the 2D image. Higher settings make the image softer. Lower settings make the image sharper.

Changing the Default 3D Settings

To change the default settings for 3D Mode attributes:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **3D** tab.

   The **3D** window opens.

3. Choose default settings for **Scan Geometry**, **Scan Direction**, **Scan Length**, **Scan Angle**, and **Region of Interest** (**ROI**).
4. Click **Apply**.
5. Click **Close**.

3D Image Review

About 3D Image Review

After you acquire the 3D dataset, the 3D image appears on the imaging screen. You can then manipulate the 3D image using the system control panel keys and the soft keys.

To display or hide the cursor in 3D Image Review, press the **Enter** key. When the cursor is hidden, the trackball function is highlighted on the bottom right corner of the imaging screen.

The default trackball functions are **Orbit** and **Rotate**. You can press the **Zoom** key to change the trackball functions to **Zoom** and **Pan**.

Note: If you want to acquire another 3D dataset while you are reviewing a 3D dataset, press the **Acquire** soft key to exit 3D Image Review.

Using 3D Image Review Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Archive: Use the **Archive** soft key to save the 3D dataset or the still image to the patient's study. The title is saved with a dataset. The title and labels are saved with a still image.

Colorize: Use the **Colorize** soft key to replace the grayscale map with a color map. The choices are **Gray**, **Amber**, **Beige**, **Sepia**, and **Skin**.

Image Invert: Use the **Image Invert** soft key to reverse the order of the 2D frames and construct a new 3D image. **Image Invert** reverses the left/right orientation of the image.

Movie: Use the **Movie** soft key to display an animation of the 3D image.

Re-acquire: Use the **Re-acquire** soft key to leave 3D Image Review to prepare to acquire a new 3D dataset.

Render Mode: Use the **Render Mode** soft key to change the way the 3D image is displayed. The values are

- **Gradient** — An image that can be adjusted to display surface shape or textures using the **Texture** and **Brightness** settings
- **X-ray** — An X-ray-like translucent image (adjust the translucency with the **Transparency** setting)
- **MaxIP** — A projection showing only the maximum gray values along the current viewing direction

Reset: Use the **Reset** soft key to restore the 3D image to its original state.

Save to Disk: Use the **Save to Disk** soft key to save the displayed frame to an optical disk or to a floppy disk as a .bmp file.

Title: Use the **Title** soft key to create a title for the 3D image. The **Title** soft key is only available when you press the **Label** key.

Trim: Use the **Trim** soft key to display the trim tool, a crosshair, on the imaging screen. The trim tool allows you to remove any undesirable tissue from a 3D image.

Undo: Use the **Undo** soft key to cancel the last image manipulation.

Redo: Use the **Redo** soft key to restore the image manipulation that was most recently canceled.

Orbiting or Rotating a 3D Image

Orbiting a 3D Image

To orbit the 3D image like a sphere around its center point:

1. If the cursor appears on the imaging screen, press the **Enter** key to remove the cursor from the imaging screen.
2. If **Zoom** and **Pan** appear on the bottom right corner of the imaging screen, press the **Zoom** key.

   Rotate and **Orbit** appear on the bottom right corner of the imaging screen.
3. Press the **Select** key until **Orbit** is highlighted.
4. To orbit the image, move the trackball.

Rotating a 3D Image

To rotate the 3D image clockwise or counterclockwise, turn the **Angle** rotary control, or perform this procedure:

1. If the cursor appears on the imaging screen, press the **Enter** key to remove the cursor from the imaging screen.
2. If **Zoom** and **Pan** appear on the bottom right corner of the imaging screen, press the **Zoom** key.

   Rotate and **Orbit** appear on the bottom right corner of the imaging screen.
3. Press the **Select** key until **Rotate** is highlighted.
4. To rotate the image, move the trackball.

Moving a 3D Image Around the Imaging Screen

To move the 3D image around the imaging screen:

1. If the cursor appears on the imaging screen, press the **Enter** key to remove the cursor from the imaging screen.
2. If **Rotate** and **Orbit** appear on the bottom right corner of the imaging screen, press the **Zoom** key.

   Zoom and **Pan** appear on the bottom right corner of the imaging screen.
3. Press the **Select** key until **Pan** is highlighted.
4. To move the 3D image around the imaging screen, move the trackball.

Magnifying a 3D Image

To enlarge or reduce the size of the 3D image, you can either press the up or the down arrow on the **Depth** key or perform this procedure:

1. If the cursor appears on the imaging screen, press the **Enter** key to remove the cursor from the imaging screen.
2. If **Zoom** and **Pan** do not appear on the bottom right corner of the imaging screen, press the **Zoom** key.

   Zoom and **Pan** appear on the bottom right corner of the imaging screen.
3. Press the **Select** key until **Zoom** is highlighted.
4. To enlarge the image, move the trackball up or to the right. To reduce the size of the image, move the trackball down or to the left.

Using the Trim Tool in 3D Mode

You can remove any undesirable tissue from a 3D image with the trim tool.

1. Press the **Trim** soft key.

   The trim tool, a crosshair, appears on the imaging screen.
2. Use the trackball to move the trim tool to the area that you want to remove from the image.
3. Press the **Enter** key to begin tracing the area that you want to remove.
4. Use the trackball to trace the area that you want to remove.
5. Press the **Enter** key again to remove the tissue within the enclosed area.

Placing a Title Above a 3D Image

You can place a title above a 3D image before you save the 3D dataset. It appears on the upper left corner of the imaging screen.

To place a title above a 3D image:

1. Press the **Label** key.

   The **Title** soft key appears.

2. Press the **Title** soft key.
3. Do one of the following:

- If no title currently exists, a cursor appears on the upper left corner of the imaging screen. Type a title for the 3D image.
- If a title already exists, the title is selected so that you can edit it.

  Note: To delete the title, press the **Del** key.

4. When you are finished, press the **Label** key.

Placing a Label on a 3D Image

You can type a label anywhere on a 3D image.

To place a label on a 3D image:

1. Press the **Label** key.
2. Use the trackball to move the **I** cursor to the location where you want to type a label.
3. Type the label.
4. If necessary, you can move, edit, or delete the label:

- To move the label, use the trackball to move the cursor over the label, press the **Enter** key, and move the label with the trackball. Press the **Enter** key again to reposition the label.
- To edit the label, use the trackball to move the cursor over the label until the cursor starts to blink. Use the backspace key to remove characters. Then type new characters.

- To delete the label, use the trackball to move the cursor over the label. Press the **Del** key. If you press the **Del** key without moving the cursor over a label, all labels are deleted.

5. When you are finished, press the **Label** key.

Changing 3D Image-Display Settings

While you are reviewing a 3D image, you can change settings that affect the image display:

Image Filter smooths structures in the 3D image and can enhance the appearance of the 3D image. The values are

- **No 3D Filter** — Great structural detail
- **Normal** — Good compromise between structural detail and a smooth display
- **Heavy** — Smooth image, artifact and some noise removed
- **Massive** — Very smooth image

Image Length: When the **Scan Geometry** soft key setting is **Length**, **Image Length** adjusts the length of the 3D image.

Image Angle: When the **Scan Geometry** soft key setting is **Fan**, **Image Angle** adjusts the width of the 3D image. Making this adjustment reduces distortion.

Intensity adjusts the brightness of the 3D image.

Texture uses gradient shading to highlight the surface shape of structures (when the value is **0**) and texture shading to highlight the gray values and textures in the volume (when the value is **100**). Choosing an intermediary value uses a combination of gradient and texture shading.

Threshold makes dark areas of the 3D image invisible, to separate the object of interest from the background. Gray values above the specified threshold are taken into account when constructing the 3D image; gray values below the threshold are not. When the value is **0**, all 3D data is used to create the rendered 3D image. When the value is **100**, no 3D data is used to create the rendered 3D image.

Transparency adjusts the transparency of the 3D image. A value of **0** results in a completely opaque projection. A value of **100** produces a translucent appearance.

To change 3D image-display settings:

1. Press the **Enter** key until a cursor appears on the imaging screen.
2. To change the **Transparency**, **Threshold**, **Texture**, **Intensity**, **Image Length**, or **Image Angle** setting, click the up or the down arrow next to the name of the setting.
3. To change the **Image Filter** setting, choose a value from the **Image Filter** drop-down menu.
4. When you finish changing settings, press the **Enter** key again.

Changing the 3D Render Mode

You can change the way the 3D image is displayed by changing the render mode. You can choose from three render mode values:

- **Gradient** — An image that can be adjusted to display surface shape or textures using the Texture and Brightness settings
- **X-ray** — An X-ray-like translucent image (adjust the translucency with the Transparency setting)
- **MaxIP** — A projection showing only the maximum gray values along the current viewing direction

To change the render mode, press the **Render Mode** soft key.

3D Movies

Viewing a 3D Movie

While you are reviewing a 3D image, you can view an animation, or movie, of the rendered 3D image.

1. To view a movie of the 3D image, press the **Movie** soft key.
2. While a movie is playing, you can do the following:

- Manipulate the movie with the 3D movie soft keys.
- Change 3D image display settings.
- Orbit, rotate, zoom, or pan the 3D image. This option is not available if the movie is stopped or paused.

- Press the **Record** key assigned to a VCR or a printer to start a VCR recording of the movie or to print the current frame.

3. When you are finished viewing the movie, press the Exit Movie soft key.

Using 3D Movie Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Archive Frame: When a movie is stopped, use the **Archive Frame** soft key to save the current frame to the patient study.

Archive Movie: When a movie is playing, use the **Archive Movie** soft key to save the movie as a loop to the patient study.

Colorize: Use the **Colorize** soft key to replace the grayscale map with a color map. The choices are **Gray**, **Amber**, **Beige**, **Sepia**, and **Skin**.

Exit Movie: Use the **Exit Movie** soft key to end the display of the 3D movie and to display the 3D image.

Image Invert: Use the **Image Invert** soft key to reverse the order of the 2D frames and construct a new 3D image. **Image Invert** reverses the left/right orientation of the image.

Render Mode: Use the **Render Mode** soft key to change the way the 3D image is displayed. The values are

- **Gradient** — An image that can be adjusted to display surface shape or textures using the **Texture** and **Brightness** settings
- **X-ray** — An X-ray-like translucent image (adjust the translucency with the **Transparency** setting)
- **MaxIP** — A projection showing only the maximum gray values along the current viewing direction

Save Frame to Disk: When a movie is stopped, use the **Save Frame to Disk** soft key to save the current frame to a floppy disk or to an optical disk as a .bmp file.

Save Movie to Disk: When a movie is playing, use the **Save Movie to Disk** soft key to save the movie to an optical disk as an .avi file.

Span: Use the **Span** soft key to adjust the range of image movement of the 3D movie in increments of 5 degrees from 30 to 180 degrees.

Speed: Use the **Speed** soft key to specify the speed of the 3D movie playback. The choices are **Slow** and **Normal**.

Stop: Use the **Stop** soft key to discontinue the playback of a 3D movie.

Play: Use the **Play** soft key to continue the playback of a 3D movie.

Note: After you save a 3D movie to disk, you may need to press the **Enter** key or the **Select** key to display the 3D movie soft keys.

Panoramic Imaging

About Panoramic Imaging

In Panoramic Imaging, you acquire a series of images in 2D Mode. These images are called the panoramic dataset. This dataset is compiled to show a larger area of anatomy. As you scan, the image frames are held in memory and then electronically stitched together for display. The panoramic image is static and appears in grayscale.

To use Panoramic Imaging, you must first acquire the panoramic dataset. You can then review and edit the panoramic image.

Notes:

- Panoramic Imaging is only available on the EnVisor HD series.
- Panoramic Imaging does not support up/down inverted images. Up/down inverted images appear uninverted in Panoramic Imaging.

Before You Use Panoramic Imaging

Before you use Panoramic Imaging, you need to assign one of the option keys to Panoramic Imaging.

Exiting Panoramic Imaging

To exit Panoramic Imaging, press the Panoramic Imaging option key or the **2D** key.

Acquiring a Panoramic Imaging Dataset

Before you use Panoramic Imaging, you must assign an option key to Panoramic Imaging.

When you use Panoramic Imaging, you must first acquire a series of 2D images, called the panoramic dataset.

To acquire a panoramic dataset:

1. To start Panoramic Imaging, press the Panoramic Imaging option key.
2. To change the appearance of your image, use the soft keys.
3. To specify the scanning direction, press the **Scan Direction** soft key.
4. Begin moving the transducer at a constant speed across the area of interest.

   Note: Avoid rocking and tilting the transducer. Do not move the transducer backward.
5. To begin acquiring the panoramic dataset, press the **Acquire** key or use the foot switch.
6. If you decide not to complete the acquisition, press the **Cancel Acquire** soft key.
7. To complete the acquisition of the panoramic dataset, press the **Acquire** key again. Imaging automatically stops if the maximum number of frames is acquired.

   The panoramic image is displayed on the imaging screen where you can review or edit it.

Using Panoramic Imaging Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Archive: Use the **Archive** soft key to save the panoramic dataset or the still image to the patient's study. The title is saved with the dataset. The title, labels, and measurements are saved with the still image.

Cancel Acquire: Use the **Cancel Acquire** soft key to discontinue the acquisition of a panoramic dataset. **Cancel Acquire** is available only while you are acquiring a panoramic dataset.

Re-acquire: Use the **Re-acquire** soft key to begin the acquisition of a new panoramic dataset.

Reset: Use the **Reset** soft key to restore the panoramic image to its original state.

Save to Disk: Use the **Save to Disk** soft key to save the panoramic image to a floppy disk or to an optical disk as a .bmp file.

Title: Use the **Title** soft key to create a title for the panoramic image. **Title** is only available when you press the **Label** key.

About the Accuracy of Panoramic Images

If the skin is moved significantly or the tissue is compressed to various degrees by the transducer during the acquisition of a panoramic dataset, resulting artifacts can affect the quality and reliability of the rendered panoramic image.

A panoramic image acquired along a radius smaller than 0.3m (such as a neck transversal or an arm or leg transversal) may not correspond to the real anatomy. Therefore, do not use such an image to make a measurement or a diagnosis based on anatomic geometry.

Warning: If you determine by the above criteria or by your own clinical training or experience that a panoramic image is poorly reconstructed, do not use the image to make dimensional measurements. If for any reason such as an image is used to make a measurement, do not use the measurement to make diagnostic decisions.

If you have any doubt about image-related artifacts or the accuracy of the panoramic image, re-acquire the panoramic dataset.

Important: Whenever possible, perform measurements on a single acquired image frame.

Panoramic Image Review

About Panoramic Image Review

After you acquire the panoramic dataset, the panoramic image appears on the imaging screen. You can then manipulate the panoramic image using the system control panel keys and soft keys.

To display or hide the cursor in Panoramic Image Review, press the Enter key. When the cursor is hidden, the trackball function is highlighted on the bottom right corner of the imaging screen.

The default trackball functions are **Pan** and **Rotate**. You can press the **Zoom** key to change the trackball function to **Zoom**.

Performing Measurements on a Panoramic Image

You can perform two-point measurements on a panoramic image. You cannot perform other measurements on a panoramic image.

You can delete measurements on a panoramic image, but you cannot reactivate measurements.

Placing a Title Above a Panoramic Image

You can place a title above a panoramic image before you save the panoramic dataset. It appears on the upper left corner of the imaging screen.

To place a title above a panoramic image:

1. Press the **Label** key.

   The **Title** soft key appears.
2. Press the **Title** soft key.
3. Do one of the following:

- If no title currently exists, a cursor appears on the upper left corner of the imaging screen. Type a title for the panoramic image.
- If a title already exists, the title is selected so that you can edit it.

  Note: To delete the title, press the **Del** key.

4. When you are finished, press the **Label** key again.

Placing a Label on a Panoramic Image

You can type a label anywhere on a panoramic image.

To place a label on a panoramic image:

1. Press the **Label** key.
2. Use the trackball to move the **I** cursor to the location where you want to type a label.
3. Type the label.
4. (Optional) You can move, edit, or delete the label:

- To move a label, use the trackball to move the cursor over the label, press the **Enter** key, and move the label with the trackball. Press the **Enter** key again to reposition the label.
- To edit a label, use the trackball to move the cursor over the label until the cursor starts to blink. Use the backspace key to remove characters. Then type new characters.
- To delete a label, use the trackball to move the cursor over the label. Press the **Del** key. If you press the **Del** key without moving the cursor over a label, all labels are deleted.

5. When you are finished, press the **Label** key again.

Magnifying a Panoramic Image

To enlarge or reduce the size of the panoramic image, press the up or the down arrow on the **Depth** key, or perform this procedure:

1. If the cursor appears on the imaging screen, press the **Enter** key to remove the cursor from the imaging screen.
2. If **Pan** and **Rotate** appear on the bottom right corner of the imaging screen, press the **Zoom** key.

   Zoom is highlighted on the bottom right corner of the imaging screen.
3. To enlarge the image, move the trackball up or to the right. To reduce the size of the image, move the trackball down or to the left.

Moving a Panoramic Image Around the Imaging Screen

To move the panoramic image around the imaging screen:

1. If the cursor appears on the imaging screen, press the **Enter** key to remove the cursor from the imaging screen.
2. If **Zoom** appears on the bottom right corner of the imaging screen, press the **Zoom** key.

   Pan and **Rotate** appear on the bottom right corner of the imaging screen.
3. Press the **Select** key until **Pan** is highlighted in the bottom right corner of the imaging screen.

4. To move the panoramic image around the imaging screen, move the trackball.

Rotating a Panoramic Image

To rotate the panoramic image clockwise or counterclockwise, turn the **Angle** rotary control, or perform this procedure:

1. If the cursor appears on the imaging screen, press the **Enter** key to remove the cursor from the imaging screen.
2. If **Zoom** appears on the bottom right corner of the imaging screen, press the **Zoom** key.

   Pan and **Rotate** appear on the bottom right corner of the imaging screen.
3. Press the **Select** key until **Rotate** is highlighted.
4. Move the trackball.

You can change the point that the panoramic image rotates around.

To change the point of rotation:

1. Press the **Enter** key until the cursor appears on the imaging screen.
2. Use the trackball to move the cursor to the point you want the panoramic image to rotate around.
3. Press the **Enter** key again to reposition the point of rotation.

Imaging Tips

About Imaging Tips

Imaging tips help you improve the appearance of your image or solve problems you encounter while imaging. Imaging tips are available for several imaging modes.

Imaging Tips for 2D Mode

Goal:

I need to be able to see the soft tissue.

Possible Actions:

- Reposition the transducer.
- Increase the gain by turning the 2D **GAIN** rotary control clockwise.
- Move the **TGC** slide controls to the right.
- Adjust the compression with the **Compress** soft key.
- Use the **Fusion** key to try a different fusion setting.
- Adjust the Smooth setting with the **Smooth** soft key.
- Use the **Colorize** soft key to improve the contrast resolution.
- Increase the persistence with the **Persist** soft key
- Increase the power by turning the **Power** rotary control clockwise.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want the image to be less soft, hazy, or gray.

Possible Actions:

- Decrease the gain by turning the 2D **GAIN** rotary control counterclockwise.
- Move the **TGC** slide controls to the left.
- Change the grayscale contrast with the **Map** soft key.

- Decrease the compression with the **Compress** soft key.
- Decrease the Smooth setting with the **Smooth** soft key.
- Sharpen the image by decreasing the persistence with the Persist soft key.
- If you are using a transducer that supports harmonics, press the **THI** key to turn on Tissue Harmonic Imaging.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I need to increase the penetration.

Possible Actions:

- Press the **Fusion** key to try the **P** (Penetration) setting.
- Press the down arrow on the Focus key to lower the position of the focal zones.
- Increase the gain by turning the 2D **GAIN** rotary control clockwise.
- Move the bottommost **TGC** slide controls to the right.
- Increase the power by turning the **Power** rotary control clockwise.

Note: After adjusting any control, always check the position of the transducer.

Goal:

I need to improve the resolution.

Possible Actions:

- Press the **Fusion** key to try the **R** (Resolution) setting.
- Use the Focus key to move the focal zone to the area of interest.
- If you are using a linear or a curved linear transducer, use the **Focal Zones** soft key to increase the number of focal zones.
- Adjust the compression with the **Compress** soft key.If you are using a linear transducer, adjust the **Angle** rotary control to achieve the optimal angle for the 2D structure.
- Resize the image with the trackball to make it narrower.

- Increase the persistence with the **Persist** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want the fluid-filled structures to have fewer echoes.

Possible Actions:

- Decrease the gain by turning the 2D **GAIN** rotary control counterclockwise.
- Move the **TGC** slide controls to the left.
- Decrease the compression with the **Compress** soft key.
- If you are using a transducer that supports harmonics, press the **THI** key to turn on Tissue Harmonic Imaging.
- Choose a more contrasty postprocessing map with the **Map** soft key.
- Decrease the Smooth setting with the **Smooth** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want the image to be less contrasty or grainy.

Possible Actions:

- Change the grayscale postprocessing map to a softer, less contrasty map with the **Map** soft key.
- Increase compression with the **Compress** soft key.
- Increase the Smooth setting with the **Smooth** soft key.
- Press the **Fusion** key to try other Fusion settings.
- Increase the persistence with the **Persist** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Imaging Tips for MMode

Goal:

I want to reduce noise in the MMode trace.

Possible Actions:

- Decrease the gain by turning the Doppler **Gain** rotary control counterclockwise.
- Select a map with more contrast using the **Map** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want to increase the size of the MMode trace.

Possible Actions:

- Change the MMode format to **Small over large** or **Full screen**.
- Use the **Zoom** key to make the MMode trace larger.

Note: After adjusting any soft key, always check the position of the transducer.

Imaging Tips for PW Doppler

Goal:

I want the 2D reference image to be updated.

Possible Actions:

- Make sure that the **Delay** or the **Update** soft key does not read **2D Hold On**.
- Change the Update interval at which your 2D image is updated with the **Update** soft key.
- Increase the ECG Gain setting with the **ECG Gain** soft key. (Press the **Setup** key to display the **ECG Gain** soft key.)
- Press the **Enter** key or the **Spectral** key to manually update the 2D image. Press the **Enter** key or the **Spectral** key again to make the spectral trace live again.

- Check the ECG leads for proper placement.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want to display low-velocity signals.

Possible Action:

- Decrease the scale by turning the **Scale** rotary control counterclockwise.
- Decrease the Filter setting with the **Filter** soft key.

Note: After adjusting any soft key, always check the position of the transducer.

Goal:

I need to be able to see a Doppler signal that is audible, but not visible.

Possible Actions:

- Adjust the scale by turning the **Scale** rotary control.
- Increase the gain by turning the Doppler Gain rotary control clockwise.
- Increase the compression with the Compress soft key and decrease the Reject setting with the **Reject** soft key to increase the range of echoes displayed.
- Decrease the Filter setting with the **Filter** soft key.
- If you are in PW Doppler, turn the **Angle** rotary control to adjust the estimated angle of flow.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I need to unwrap an aliased spectrum.

Possible Actions:

- Adjust the **Baseline** rotary control to unwrap the signal.

- Increase the scale by turning the Scale rotary control clockwise to increase the range of displayed velocities and to decrease the size of the waveform.

Note: After adjusting any control, always check the position of the transducer.

Goal:

I want to remove artifacts from the spectrum.

Solution:

- Decrease the gain by turning the Doppler **Gain** rotary control counterclockwise.
- Increase the Filter setting with the **Filter** soft key.
- Decrease the power by turning the **Power** rotary control counterclockwise.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want to reduce noise in the spectrum.

Possible Actions:

- Decrease the gain by turning the Doppler **Gain** rotary control counterclockwise.
- If you have an EnVisor HD or an EnVisor C HD, press the **Setup** key, click the **Mode** tab, and select **Adaptive Doppler**.
- Increase the Filter setting with the **Filter** soft key.
- Increase the Reject setting with the **Reject** soft key.
- Decrease the compression with the **Compress** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Imaging Tips for CW Doppler

Goal:

I want the 2D reference image to be updated.

Possible Actions:

- Make sure that the **Delay** or the **Update** soft key does not read **2D Hold On**.
- Change the Update interval at which your 2D image is updated with the **Update** soft key.
- Increase the ECG Gain setting with the **ECG Gain** soft key. (Press the **Setup** key to display the **ECG Gain** soft key.)
- Press the **Enter** key or the **Spectral** key to manually update the 2D image. Press the **Enter** key or the **Spectral** key again to make the spectral trace live again.
- Check the ECG leads for proper placement.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want to display low-velocity signals.

Possible Action:

- Decrease the scale by turning the **Scale** rotary control counterclockwise.
- Decrease the Filter setting with the **Filter** soft key.

Note: After adjusting any soft key, always check the position of the transducer.

Goal:

I need to be able to see a Doppler signal that is audible, but not visible.

Possible Actions:

- Adjust the scale by turning the **Scale** rotary control.
- Increase the gain by turning the Doppler Gain rotary control clockwise.
- Increase the compression with the Compress soft key and decrease the Reject setting with the **Reject** soft key to increase the range of echoes displayed.
- Decrease the Filter setting with the **Filter** soft key.
- If you are in PW Doppler, turn the **Angle** rotary control to adjust the estimated angle of flow.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want to remove artifacts from the spectrum.

Solution:

- Decrease the gain by turning the Doppler **Gain** rotary control counterclockwise.
- Increase the Filter setting with the **Filter** soft key.
- Decrease the power by turning the **Power** rotary control counterclockwise.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want to reduce noise in the spectrum.

Possible Actions:

- Decrease the gain by turning the Doppler **Gain** rotary control counterclockwise.
- If you have an EnVisor HD or an EnVisor C HD, press the **Setup** key, click the **Mode** tab, and select **Adaptive Doppler**.
- Increase the Filter setting with the **Filter** soft key.
- Increase the Reject setting with the **Reject** soft key.
- Decrease the compression with the **Compress** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want the Doppler to be more sensitive.

Possible Actions:

- Increase the gain by turning the Doppler **Gain** rotary control clockwise, increase the compression with the Compress soft key, and decrease the Reject setting with the **Reject** soft key to increase the amount of Doppler information displayed.

- If you have an EnVisor HD or EnVisor C HD, press the **Setup** key, click the **Mode** tab, and select the **Adaptive Doppler** check box.
- If you are using a linear transducer, adjust the **Steer** soft key to achieve the optimal angle to flow.
- If you are in PW Doppler and you are using a multifrequency transducer, use the **Frequency** soft key to select the lowest frequency. Otherwise, use a lower frequency probe.
- If you are in PW Doppler, increase the size of the PW sample volume gate with the **Gate** soft key.
- If you are in CW Doppler, use the trackball to move the focus diamond on the CW reference line over the area where the greatest sensitivity is needed.

Note: After adjusting any control or soft key, always check the position of the transducer.

Imaging Tips for Color Mode

Goal:

I want to unwrap aliased signals.

Possible Actions:

- Increase the scale by turning the **Scale** rotary control clockwise.
- Unwrap aliased signals by adjusting the **Baseline** rotary control.
- If you are using a multifrequency transducer, use the **Frequency** soft key to select the lowest frequency. Otherwise, use a lower frequency transducer.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want the color to have less noise, flashing, or artifacts.

Possible Actions:

- Decrease the gain by turning the Doppler **Gain** rotary control counterclockwise.
- Increase the Filter setting with the **Filter** soft key.

- Increase the scale by turning the **Scale** rotary control clockwise.
- Resize the color box to make it narrower, to remove the source of artifacts.
- Increase the persistence with the **Persist** soft key.

Notes:

- After adjusting any control or soft key, always check the position of the transducer.
- In cardiac imaging, mechanical heart valves occasionally cause unavoidable flashing artifact. Artifact can also be caused by external sources such as lighting, other equipment, or telecommunications devices.

Goal:

I want the color to be less speckled or fragmented.

Possible Actions:

- Increase the gain by turning the Doppler **Gain** rotary control clockwise.
- Increase the Smooth setting with the **Smooth** soft key.
- For slow-moving blood or structures, increase the persistence with the **Persist** soft key.
- Decrease the Density setting with the **Density** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I need to increase the frame rate.

Possible Actions:

- Resize the color box to make it smaller.
- If the scale setting is very low, increase the scale by turning the **Scale** rotary control clockwise.
- If you are using a sector or curved linear transducer, turn on B/W Suppress with the **B/W Suppress** soft key.

- If you are using a linear transducer, resize the 2D image before pressing the **Color** key to turn on Color Mode.
- Decrease the packet size with the **Packet** soft key.
- Decrease the Density setting with the **Density** soft key.
- Decrease the imaging depth with the **Depth** key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want the color to be more sensitive.

Possible Actions:

- Reposition the transducer.
- Increase the gain by turning the Doppler **Gain** rotary control clockwise.
- Use the **Focus** key to place the focal zone at the area of interest.
- Decrease the scale by turning the Scale rotary control counterclockwise.
- Decrease the Filter setting with the **Filter** soft key.
- Increase the Smooth setting with the **Smooth** soft key.
- Change the Doppler frequency with the **Frequency** soft key.
- Decrease the density with the **Density** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I need to improve the color filling.

Possible Actions:

- Increase the gain by turning the Doppler Gain rotary control clockwise.
- Use the **Focus** key to place the focal zone at or just below the area of interest.
- Decrease the scale by turning the **Scale** rotary control counterclockwise.

- Decrease the Filter setting with the **Filter** soft key.
- Increase the packet size with the **Packet** soft key.
- Decrease the density with the **Density** soft key.
- For slow-moving blood or structures, increase the persistence with the **Persist** soft key.
- Increase the Smooth setting with the **Smooth** soft key.
- If you are using a linear transducer, use the **Angle** rotary control to adjust the color box to achieve the optimal angle for the 2D structure.
- If you are using a multifrequency transducer, use the **Frequency** soft key to select a lower frequency.

Note: After adjusting any control or soft key, always check the position of the transducer.

Imaging Tips for Color Power Angio

Goal:

I want the angio to have less noise, flashing, or artifacts.

Possible Actions:

- Decrease the gain by turning the Doppler **Gain** rotary control counterclockwise.
- Increase the persistence with the **Persist** soft key.
- Increase the scale by turning the **Scale** rotary control clockwise.
- Resize the angio box to make it narrower, to remove the source of artifacts.
- Increase the Filter setting with the **Filter** soft key.

Notes:

- After adjusting any control or soft key, always check the position of the transducer.
- In cardiac imaging, mechanical heart valves occasionally cause unavoidable flashing artifact. Artifact can also be caused by external sources such as lighting, other equipment, or telecommunications devices.

Goal:

I need to increase the frame rate.

Possible Actions:

- Resize the angio box to make it smaller.
- If the scale setting is very low, increase the scale by turning the **Scale** rotary control clockwise.
- If you are using a sector or curved linear transducer, turn on B/W Suppress with the **B/W Suppress** soft key.
- If you are using a linear transducer, resize the 2D image before pressing the **Angio** key to turn on Color Power Angio.
- Decrease the packet size with the **Packet** soft key.
- Decrease the Density setting with the **Density** soft key.
- Decrease the imaging depth with the **Depth** key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I want the angio to be more sensitive.

Possible Actions:

- Reposition the transducer.
- Increase the gain by turning the Doppler **Gain** rotary control clockwise.
- Use the **Focus** key to place the focal zone at the area of interest.
- Decrease the scale by turning the Scale rotary control counterclockwise.
- Decrease the Filter setting with the **Filter** soft key.
- Increase the Smooth setting with the **Smooth** soft key.
- Change the Doppler frequency with the **Frequency** soft key.
- Decrease the density with the **Density** soft key.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I need to improve the angio filling.

Possible Actions:

- Increase the gain by turning the Doppler Gain rotary control clockwise.
- Use the **Focus** key to place the focal zone at or just below the area of interest.
- Decrease the scale by turning the **Scale** rotary control counterclockwise.
- Decrease the Filter setting with the **Filter** soft key.
- Increase the packet size with the **Packet** soft key.
- Decrease the density with the **Density** soft key.
- For slow-moving blood or structures, increase the persistence with the **Persist** soft key.
- Increase the Smooth setting with the **Smooth** soft key.
- If you are using a linear transducer, use the **Angle** rotary control to adjust the angio box to achieve the optimal angle for the 2D structure.
- If you are using a multifrequency transducer, use the **Frequency** soft key to select a lower frequency.

Note: After adjusting any control or soft key, always check the position of the transducer.

Goal:

I need to improve the angio resolution.

Possible Actions:

- Use the **Focus** key to place the focal zone at the area of interest.
- Increase the packet size with the **Packet** soft key.
- For small vessels, decrease the Smooth setting with the **Smooth** soft key.
- Increase the Density setting with the **Density** soft key.

- If you are using a multifrequency transducer, use the **Frequency** soft key to select a higher frequency.

Note: After adjusting any control or soft key, always check the position of the transducer.

5

Imaging Tools

About Imaging Tools

The EnVisor Series offers four imaging tools that give you more flexibility and options while you are imaging a patient:

- Biopsy
- Dual Imaging
- Quick Review
- Zoom

Biopsy Feature

About the Biopsy Feature

The Biopsy feature helps a physician position a transducer and an attached biopsy needle during an ultrasound biopsy procedure by displaying one or two guidelines on the image that show the anticipated path of the biopsy needle.

Note: The biopsy guide for the L12-5 50 has infinite angle capability and can be installed on either side of the transducer; it does not constrain the biopsy needle to a particular path. Because the needle path is not predictable, neither biopsy soft keys nor biopsy graphics appear on the imaging screen when you are using the L12-5 50 transducer. For information about the L12-5 50 biopsy guide, see the *EnVisor Series Transducer Guide* in the *EnVisor Series Reference Guide*.

Warnings:

- See the EnVisor Series Transducer Guide in the EnVisor Series Reference Guide for important information about biopsy-capable transducers.
- Biopsy guidelines are intended as guides only. Never use biopsy guidelines as an absolute reference.
- Biopsy guidelines do not take into account the possible bending of the needle.
- The crossover depth is only an estimate. Never use the crossover depth exclusively to identify the needle position on the biopsy guide. Never use the crossover depth as a replacement for using the depth marker or performing measurements.

- Some biopsy guides can inadvertently be installed backward. When you turn the Biopsy feature on for the first time during an exam, a warning appears on the imaging screen if the selected transducer supports one of these biopsy guides.

Turning the Biopsy Feature On

If you are in 2D Mode and a noncardiac preset and are using a transducer that supports biopsy, press the **Next** soft key. The **Biopsy** soft key appears.

To turn the Biopsy feature on, press the **Biopsy** soft key and choose either the **Gun** or **Needle** setting.

If the selected transducer supports a biopsy guide with more than one needle position, a soft key that lists the transducer name and the current crossover depth (the **<Crossover Depth>** soft key) appears next to the **Biopsy** soft key. Press the **<Crossover Depth>** soft key to choose the correct crossover depth.

Notes:

- If the selected transducer supports a biopsy guide that can inadvertently be installed backward, a warning appears on the imaging screen.
- The biopsy guide for the L12-5 50 has infinite angle capability. When you are using the L12-5 50 transducer, neither biopsy soft keys nor biopsy graphics appear on the imaging screen. For information about the L12-5 50 biopsy guide, see the EnVisor Series Transducer Guide in the EnVisor Series Reference Guide.

Using Biopsy Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Biopsy: Use the **Biopsy** soft key to initiate the biopsy feature. **Biopsy** has three settings:

- **Off** – Turns the Biopsy feature off.
- **Needle** – Two guide lines appear that outline the area in which the biopsy needle path is most likely to be.
- **Gun** – One guide line appears that shows the anticipated path of the biopsy needle.

The **Biopsy** soft key is only available when you are in 2D Mode and a noncardiac preset and are using a transducer that supports biopsy.

- See the EnVisor Series Transducer Guide for important information about using biopsy-capable transducers.**Warnings:**
- Biopsy guide lines are intended as guides only. Never use biopsy guide lines as an absolute reference.
- Biopsy guide lines do not take into account the possible bending of the needle.

<Crossover Depth>: The **<Crossover Depth>** soft key shows the name of the selected transducer and its crossover depth. The crossover depth is the distance along the centerline of the image from the transducer lens surface to the intersection with the anticipated needle path.

The **<Crossover Depth>** soft key is only available when the **Biopsy** soft key setting is **Gun** or **Needle** and the selected transducer supports multiple crossover depths.

If the selected transducer supports a biopsy guide with more than one needle position, a soft key that lists the transducer name and the current crossover depth (the **<Crossover Depth>** soft key) appears next to the **Biopsy** soft key. Press the **<Crossover Depth>** soft key to choose the correct crossover depth.

Warning: The crossover depth is only an estimate. Never use the crossover depth exclusively to identify the needle position on the biopsy guide. Never use the crossover depth as a replacement for using the depth marker or performing measurements.

Moving the Biopsy Depth Marker

A depth marker (a crosshair) appears on the anticipated needle path. The minimum needle length needed to reach the depth marker appears at the top of the imaging screen.

Note: The depth marker may not appear on the image until you move the trackball down.

To move the biopsy depth marker:

1. Press the **Select** key until **Needle** is highlighted on the bottom right corner of the imaging screen.
2. Move the biopsy depth marker with the trackball.

Dual Imaging

About Dual Imaging

Dual Imaging allows you display two images side by side so that you can compare them. You can choose which image is frozen and which is live, or you can freeze both images and choose which one is active so that you can review the frames using Quick Review.

Dual Imaging is available in 2D Mode, Tissue Harmonic Imaging, Color Mode, and Color Power Angio.

Using Dual Imaging

To use Dual Imaging when an image is live, press the **Left** or the **Right** key.

- If you press the **Left** key, the live image appears on the left, and the frozen image appears on the right.
- If you press the **Right** key, the live image appears on the right, and the frozen image appears on the left.

To use Dual Imaging when an image is frozen, press the **Left** or the **Right** key.

- If you press the **Left** key, the frozen image appears on the left, and the live image appears on the right.
- If you press the **Right** key, the frozen image appears on the right, and the live image appears on the left.

Note: The live image is marked with a small open circle, called a transducer orientation dot; the frozen image is marked with a small solid circle.

To choose which image is live, press the key (**Left** or **Right**) for the image that you want to be live.

For the live image, you can turn Color Mode, Color Power Angio, or Zoom on or off by pressing the **Color**, **Angio**, or **Zoom** key.

To use Color Suppress or Color Power Angio Suppress on the frozen image, press the **Freeze** key and then the **Color** key.

To exit Dual Imaging, press one of the following keys: **2D**, **CW**, **MMode**, **Plex**, **PW**, or **Spectral**. You may need to press the key twice.

Using Quick Review in Dual Imaging

In Dual Imaging, you can freeze both images and use Quick Review on the active image.

To use Quick Review while you are in Dual Imaging:

1. Press the **Freeze** key.

   Both images are frozen. The active image is labeled with an open circle. The inactive image is labeled with a solid circle.

2. To scroll through the active image frame by frame, move the trackball.
3. To change which image is active, press the control (**Left** or **Right**) for the image that you want to be active.
4. To unfreeze the active image, press the **Freeze** key again.

Quick Review

About Quick Review

Quick Review allows you to interrupt live imaging and scroll through a loop, scroll through a trace, or cause a loop to play back.

- If you are in 2D Mode, Color Power Angio, or Color Mode, you can either scroll through the loop frame by frame or cause the loop to play back repeatedly.
- If you are in CW Spectral Doppler, PW Spectral Doppler, or MMode Trace, you can scroll through either the image loop or the trace.

Using Quick Review

To use Quick Review:

1. While in live imaging, press the **Freeze** key.

   The image freezes on the current frame.

2. If you are in 2D, Angio, or Color Mode, press the **Select** key until **Scroll** is highlighted on the bottom right corner of the imaging screen.
3. If you are in CW Spectral Doppler, PW Spectral Doppler, or MMode, do one of the following:

- To scroll through the image loop, press the **Select** key until **Image** is highlighted on the bottom right corner of the imaging screen.
- To scroll through the trace, press the **Select** key until **Trace** is highlighted on the bottom right corner of the imaging screen.

4. Move the trackball to the right or the left to scroll forward or backward frame by frame.
5. (Optional) To save the frame to the patient study, press the **Acquire** key.
6. To return to live imaging, press the **Freeze** key again.

Using Quick Review Soft Keys

When you are in Quick Review, other soft keys appear, depending on the mode. If you are in MMode, PW Doppler, or CW Doppler, the soft keys apply to the image when **Image** is highlighted on the bottom right corner of the imaging screen. The soft keys apply to the trace or the spectrum when **Trace** is highlighted.

To change any of the settings listed below, press the oval key below the soft key label.

Edit End: Use the **Edit End** soft key to reposition the end of a Quick Review loop. **Edit End** is not available in PW Doppler, CW Doppler, or MMode.

Edit Start: Use the **Edit Start** soft key to reposition the beginning of a Quick Review loop. **Edit End** is not available in PW Doppler, CW Doppler, or MMode.

Playing Back a Quick Review Loop

You can repeatedly play back a Quick Review loop if you are in 2D Mode, Color Power Angio, or Color Mode:

1. While in live imaging, press the **Freeze** key.

   The image freezes on the current frame.
2. To play back the loop, press the **Select** key until **Replay** is highlighted on the bottom right corner of the imaging screen.
3. (Optional) Move the trackball to the right or the left to increase or decrease the playback speed.
4. (Optional) Use the **Edit Start** and **Edit End** soft keys to adjust the endpoints of the loop.

5. (Optional) To save the loop to the patient study, press the **Acquire** key.

   Note: Only the portion of the loop between the **Start** and the **End** markers is saved to the study.

6. To return to live imaging, press the **Freeze** key again.

Setting the Length of a Quick Review Loop

You can specify the length (in seconds or number of heartbeats) of the Quick Review loop.

To specify the length of the loop:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Acquisition** tab.

   The **Acquisition** window opens.

3. Do one of the following:

- To define the length of the loop in seconds, choose **Time**.
- To define the length of the loop in number of heartbeats, choose **Beats**.

4. To change the number of **Seconds** or **Heartbeats**, click the up or the down arrow.
5. Click **Apply**.
6. Click **Close**.

Zoom

About Zoom

You can use Zoom to magnify a portion of an image. The magnified area has high resolution because the pixels are reanalyzed, not simply enlarged.

Using Zoom

To use Zoom:

1. Press the **Zoom** key.

   A zoom box appears on the image.

2. Change the size and position of the zoom box with the trackball so that the zoom box contains the area that you want to magnify.

3. Press the **Zoom** key again or press the **Enter** key.

   The magnified area appears.

4. (Optional) To increase or decrease the magnification factor, press the up or the down arrow on the **Depth** key.

5. (Optional) To change the size or position of the magnified portion of the image, press the **Select** key while the image is live until **Size** or **Position** is highlighted on the bottom right corner of the imaging screen. Use the trackball to resize or reposition the magnified portion of the image.

6. To exit, press the **2D** key or the **Zoom** key.

Color Zoom

About Color Zoom

Color Zoom shows color flow in a magnified image.

Using Color Zoom

To use Color Zoom:

1. Press the **Color** key.

2. Change the size and position of the color box if necessary.

3. Press the **Zoom** key.

   A zoom box appears on the image.

4. Change the size and position of the zoom box with the trackball so that it contains the area that you want to magnify.

   Note: As you resize and reposition the zoom box, the color box moves around the image in order to remain centered inside the zoom box.

5. Press the **Zoom** key again or press the **Enter** key.

   The magnified area appears.

6. (Optional) Change the size and position of the color box with the trackball.

   Note: The color box is limited to the size of the magnified image.

Color Power Angio Zoom

About Color Power Angio Zoom

Color Power Angio Zoom shows angio flow in a magnified image.

Using Color Power Angio Zoom

To use Color Power Angio Zoom:

1. Press the **Angio** key.
2. Change the size and position of the angio box if necessary.
3. Press the **Zoom** key.

   A zoom box appears on the image.

4. Change the size and position of the zoom box with the trackball so that it contains the area that you want to magnify.

   Note: As you resize and reposition the zoom box, the angio box moves around the image in order to remain centered inside the zoom box.

5. Press the **Zoom** key again or press the **Enter** key.

   The magnified area appears.

6. (Optional) Change the size and position of the angio box with the trackball.

   Note: The angio box is limited to the size of the magnified image.

6

Annotation

About Annotation

You can annotate an image with a body marker graphic that indicates the part of the anatomy that you are scanning. You can also place labels and arrows on an image.

Using Quick Text

You can place text on the imaging screen anytime without pressing the **Label** key or the **Menu** key. Simply position the cursor with the four arrow keys and start typing. If you do not position the cursor, the Quick Text label will appear at the home position.

Labels

About Labels

You can place a label anywhere on the imaging screen so that you can comment on the image. You can add an arrow to indicate which part of the image the label applies to.

Exiting Labels

To exit Labels, press the **Label** key or the **Menu** key above the **Label** key, or press a key for another mode or application.

Placing a Label on the Imaging Screen

You can place a label on the imaging screen by pressing the **Label** key or the **Menu** key above the **Label** key.

To place a label on the imaging screen using the **Label** key:

1. Press the **Label** key.
2. Use the trackball to position the cursor where you want the label to appear.
3. Press the **Select** key so that **Label** is highlighted on the bottom right corner of the imaging screen.
4. Move the trackball up and down to view the label choices.
5. To anchor the label, press the **Enter** key.

To place a label on the imaging screen using the **Menu** key above the **Label** key:

1. Press the **Menu** key above the **Label** key.

   The **Label** menu appears.
2. Use the trackball to highlight the label you want to place on the imaging screen.
3. Press the **Enter** key or the **Select** key, or use the trackball to move the label onto the image.
4. To anchor the label, press the **Enter** key or the **Select** key.
5. To remove the **Label** menu from the imaging screen, press the **Menu** key above the **Label** key.

Typing a Label on the Imaging Screen

To type your own label on the imaging screen using the **Label** key:

1. Press the **Label** key.

   Cursor is highlighted on the bottom right corner of the imaging screen.
2. Position the cursor with the trackball.
3. Type the label.

Modifying a Label

To modify a label on the imaging screen:

1. Press the **Label** key.
2. Use the trackball to move the cursor over the label.
3. Use the keyboard and the soft keys to add or remove text from the label.

Note: You can also press the **Tab** key on the keyboard to move word by word through the labels on the imaging screen.

Placing an Arrow on the Imaging Screen

To place an arrow on the imaging screen:

1. Press the **Label** key.
2. Press the **Arrow** soft key.

3. Use the trackball to move the arrow.
4. To anchor the arrow, press the **Enter** key.

Rotating an Arrow

To rotate an arrow:

1. Press the **Label** key.
2. Use the trackball to position the cursor over the label or the arrow.
3. Press the **Enter** key.
4. Turn the **Angle** rotary control.

Moving or Deleting a Label or an Arrow

To move a label or an arrow:

1. Press the **Label** key.
2. Use the trackball to position the cursor over the label or the arrow.
3. Press the **Enter** key.
4. Use the trackball to move the label or the arrow to the new position.
5. To anchor the label or the arrow, press the **Enter** key.
6. To delete a label or an arrow:
7. Press the **Label** key.
8. Use the trackball to position the cursor over the label or the arrow.
9. Press the **Enter** key.
10. Press the **Del** key above the **Label** key.

    Note: If you do not select a label or an arrow, pressing the **Del** key erases all labels and arrows.

Using Label Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Arrow: Use the **Arrow** soft key to place an arrow on the imaging screen.

Home: Use the **Home** soft key to move the cursor to the default position.

Long/Trans: Use the **Long/Trans** soft key to place the word *Long* or *Trans* at the current cursor position. If one of these words appears in the label, the **Long/Trans** soft key changes that word to the other word (*Long* or *Trans*).

Lt/Mid/Rt: Use the **Lt/Mid/Rt** soft key to place the word *Lt*, *Mid*, or *Rt* at the current cursor position. If one of these words appears in the selected label, the **Lt/Mid/Rt** soft key changes that word to another word in the list (*Lt*, *Mid*, or *Rt*).

Set Home: Use the **Set Home** soft key to make the current position of the cursor the default position.

Modifying a Label Menu

You can modify the menu of labels available for the current preset. You can add, delete, and change the order of labels.

To modify a label menu:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Label** tab.

   The **Label** window opens.

3. Add, delete, or rearrange the labels for the current preset.
4. Click **Apply**.
5. Click **Close**.

Body Markers

About Body Markers

You can place a body marker graphic on the imaging screen to indicate the part of the anatomy that you are scanning. When you place the body marker, a transducer icon also appears. You can manipulate it to show the position and orientation of the transducer.

Exiting Body Markers

To exit Body Markers and remove the body marker and the transducer icon from the imaging screen, press the **Erase Marker** soft key.

To exit Body Markers and leave the body marker and the transducer icon on the imaging screen, press the **Body Mark** key or the key for another mode or application.

Placing a Body Marker on the Imaging Screen

To place a body marker and a transducer icon on the imaging screen, press the **Body Mark** key. A body marker and a transducer icon appear on the imaging screen.

Choosing a Body Marker

You can choose from many body markers to represent the body part that you are scanning.

To specify which body marker appears on the imaging screen, do one of the following:

1. Press the **<Body Marker Set>** soft key repeatedly until the set of body markers that you want appears.

   Note: Body marker sets are organized by exam type.

2. Press the **<Body Marker>** soft key repeatedly until the body marker that you want appears.

Or

1. Press the **View All** soft key.

   The **Body Markers** window opens.

2. Click the tab for the exam type.
3. Move the cursor over the body marker with the trackball.
4. Press the **Enter** key.

Moving a Body Marker or the Transducer Icon

To move a body marker:

1. Press the **Select** key until **Icon** is highlighted on the bottom right corner of the imaging screen.
2. Use the trackball to move the body marker.
3. Press the **Enter** key to anchor the body marker.

To move the transducer icon:

1. Press the **Select** key until **Probe** is highlighted on the bottom right corner of the imaging screen.
2. Use the trackball to move the transducer icon.
3. To anchor the transducer icon and exit Body Markers, press the **Body Mark** key or the key for any imaging mode or application.

Rotating or Specifying the Shape of the Transducer Icon

Rotating the Transducer Icon

To rotate the transducer icon, either press the **Rotate Probe** soft key or turn the **Angle** rotary control.

Specifying the Shape of the Transducer Icon

To specify the shape of the transducer icon, press the **Next** soft key, and press the **Probe Size** soft key repeatedly until the shape that you want is displayed.

Using Body Marker Soft Keys

<Body Marker>: Use the **<Body Marker>** soft key to specify the body marker that you want. The **<Body Marker>** soft key displays the names of the body markers. Press it repeatedly to cycle through the body markers in the set of body markers specified by the **<Body Marker Set>** soft key.To change any of the settings listed below, press the oval key below the soft key label.

<Body Marker Set>: Use the **<Body Marker Set>** soft key to specify the set of body markers (organized by exam type) that you can choose from using the **<Body Marker>** soft key. The **<Body Marker Set>** soft key displays the names of body marker sets. Alternatively, you can change the body marker set by changing the preset.

Erase Marker: Use the **Erase Marker** soft key to remove the body marker from the imaging screen and exit Body Markers.

Left: Use the **Left** soft key when you in Dual Imaging to manipulate the body marker on the left-hand image.

Probe Size: Use the **Probe Size** soft key to change the size and shape of the transducer icon. Your choices are

- Large T
- Small T
- Arrow
- Small crosshair

Right: Use the **Right** soft key when you are in Dual Imaging to manipulate the body marker on the right-hand image.

Rotate Probe: Use the **Rotate Probe** soft key to rotate the transducer icon. You can also rotate the transducer icon with the **Angle** rotary control.

View All: Use the **View All** soft key to open the **Body Markers** window. You choose the body marker that appears on the imaging screen from the body markers in the **Body Markers** window.

Using Body Markers and Dual Imaging at the Same Time

To use body markers and Dual Imaging at the same time:

1. Press the **Left** key or the **Right** key while a body marker is displayed on the imaging screen, or press the **Body Mark** key while you are in Dual Imaging.

   The body marker appears on both images.
2. (Optional) Manipulate the body marker on the active image with the soft keys.
3. (Optional) To manipulate the body marker on the inactive image, press the soft key that corresponds to the inactive image (the **Left** soft key or the **Right** soft key).
4. (Optional) To freeze one of the two images, press the **Freeze** key.

   You can manipulate the body marker on the frozen image.

Activating Body Markers During Dual Imaging and Freeze

You can choose to have a body marker automatically appear on the imaging screen during Dual Imaging and Freeze (when you press the **Left** key, the **Right** key, or the **Freeze** key).

To activate body markers during Dual Imaging and Freeze:

1. Press the **Setup** key.

   The **Setup** window appears.

2. Click the **System** tab.

   The **System** window opens.

3. Select the **Activate body marker during freeze and dual** check box.

4. Click **Apply**.

Note: When you activate body markers during Dual Imaging and Freeze, the following occur:

- When you press the **Freeze** key, you must press the **Body Mark** key before using the trackball to scroll through the frames.
- When you press the **Left** key or the **Right** key, a body marker appears on both images.

Analysis

About Analysis

You can perform many unlabeled measurements, labeled measurements, and calculations based on the images you acquire. You can also perform automatic Doppler trace and manual Doppler trace measurements, and you can create your own OB/GYN calculations.

Note: When you export a study to an optical disk or over a network, no measurements or calculations are saved with your study. You can only view measurements and calculations when the study is saved on your system.

General Analysis Information

About Analysis

You can perform many unlabeled measurements, labeled measurements, and calculations based on the images you acquire. You can also perform automatic Doppler trace and manual Doppler trace measurements, and you can create your own OB/GYN calculations.

Note: When you export a study to an optical disk or over a network, no measurements or calculations are saved with your study. You can only view measurements and calculations when the study is saved on your system.

Changing Analysis Settings

You can select which labeled measurements and calculations appear in the **Measurements** menu and the **Calculations** menu, respectively, for the current preset. You can also configure protocol measurements and specify height and weight units.

To change analysis settings:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Analysis** tab.

   The **Analysis** window opens.

3. To save the changes you are about to make to a preset, clear the **Do not save changes to a preset** check box and select a preset from the **User presets** list or the **Philips presets** list.
4. Specify the **Height and Weight Units** (**English** or **Metric**).
5. If you are in an OB/GYN preset, select the **Fetal Weight Percentiles** check box if you want fetal weight percentiles to appear in the report.
6. To configure protocol measurements, click **Protocol Measurement**, select the appropriate measurements, and click **OK**.
7. To specify which measurements and calculations appear in the menu for each mode, click the appropriate button, add or remove measurements or calculations, and click **OK**.
8. Click **Apply** or **Save**.
9. Click **Close**.

Improving Measurement Accuracy

Several factors contribute to measurement accuracy, including transducer selection, display size, crosshair placement, and use of ECG trace.

Crosshair Placement

Measurement accuracy and precision ultimately depend on placing the crosshair (+) correctly on the image. For best results, use consistent techniques, use control settings that optimize image quality, and avoid artifacts that disguise tissue. To use consistent techniques, observe the following guidelines:

- For each type of measurement, use the same transducer orientation in all examinations.
- Measure from the leading edge (closest to the transducer) of an image. The A.S.E. MMode standard recommends making length measurements using the leading-edge-to-leading-edge technique.
- When measuring slopes, use measurement points as far apart as the waveform permits.

Display Size

Adjust the display so that the area of interest fills a large portion of the imaging screen. You can adjust the image display size with the **Depth** key or with the **Zoom** key and the trackball.

Sweep Speed

Time measurements in MMode and spectral Doppler are improved at high sweep settings.

Transducer Selection

Select a transducer appropriate for the application. Higher frequency transducers provide better resolution, but sacrifice penetration. Lateral resolution is best where the ultrasound beam width is narrowest, the focal region of the transducer. For best results, use a high frequency transducer for measuring small distances (if depth of penetration allows), and use a transducer that focuses near the area of interest.

In Doppler modes, lower frequency transducers can measure higher maximum velocities, but resolution is lower for lower frequency transducers than for higher frequency transducers.

Use of ECG Trace

The ECG trace represents the heart's electrical activity, and the screen image represents the heart's mechanical activity. Use the ECG trace as a guide for locating the mechanical end of the diastolic and the systolic phases.

About Measurement Primitives

The EnVisor Series uses the following primary measurements, called *primitives*, to produce other measurements and calculations.

Depth

In 2D Mode for noncardiac presets, when you press the **Measure** key, a free crosshair appears on the image, and the system reports the depth at that point in the image. The depth is displayed in centimeters as a measurement primitive in the results box. The depth is calculated from the apex (for sector transducers) or from the scanning edge of the footprint (for linear transducers) to the center of the free crosshair. A verti-

cal tic mark appears at the origin point of the depth measurement, and there is no line connecting this point with the free crosshair.

Frequency

The frequency measurement is calibrated using a frequency source traceable to the National Institute of Science and Technology (NIST). The accuracy of this calibration is considerably greater than 99%. There is no need to recalibrate this measurement given the high level of initial accuracy and the knowledge that drift due to equipment age or thermal issues should not be a routine concern.

Length

The system assumes that the speed of sound is 1540 m/sec and that this speed is homogeneous in all tissues. Several books on ultrasound cite differences in the speed of sound based on the type of tissue. One source says that sound speeds can range from 1500 to 1600 m/sec. These differences would produce an inaccuracy of up to 4%.

The length measurements on the system are verified using an AIUM standard phantom. The calibrations are performed using depth settings that give the greatest resolution for the phantom length being measured. The accuracy of this calibration should be within ± 5%.

Time

Time measurements can be used for calculations performed in the following areas: physio channels, MMode, and Doppler. The time calibration is performed using a time-interval signal generator with a calibration traceable to NIST. The calibration of the display is not expected to drift. Calibration of the time axis should be done by measuring one-second pulses at the different sweep speeds. The accuracy of these measurements should be within ±5%, independent of the sweep speed.

Note: These specifications are based on data taken with optimum control settings. Accuracy specifications can be obtained at other control settings by repeating the calibration at the desired settings. The depth and sweep speed settings have the greatest impact on measurement accuracy. The accuracy of a 1-cm length and a 3-cm^2 area measurement on a 24-cm depth display is different from the accuracy of the same measurements performed on a 4-cm depth display. Measurements taken at a sweep speed of 100 mm/second are more accurate than those taken at 25 mm/second.

About Mathematical Quantities Calculated from Primitives

Philips performs software testing to validate that measurement values and calculations are implemented as specified. A phantom is used for the area and circumference validation. Velocity is validated using a frequency generator and a cosine multiplication table. Slope calculations are validated using a calculator.

Acceleration

The Doppler spectral acceleration measurement is derived from the change in velocity divided by the change in time, using a simple slope formula.

Area

The area measurement is derived through use of the length measurement primitive. Green's Theorem is used to calculate the area. The number of points that are used in the calculation is related to how slowly the operator traces the area of interest.

The clinical accuracy of area measurements is highly dependent on the ability of the operator to accurately trace the area of interest.

You have the option to use an ellipse to calculate area. This area is calculated as follows:

$$Area = \pi \times \frac{MajorAxisLength}{2} \times \frac{MinorAxisLength}{2}$$

Circumference

The circumference of manually traced areas is derived by adding several discrete length measurements.

The clinical accuracy of circumference measurements is highly dependent on the ability of the operator to accurately trace the area of interest. The circumference measurement accuracy should be within ±5% when a phantom is used to validate the circumference.

Ellipse circumference is calculated as follows:

$$\text{Ellipse Circumference when } B > A/4 = \pi \times \left[3/2(A+B) - \sqrt{A \times B}\right]$$

$$\text{Ellipse Circumference when B} \leq A/4 = 4A + B\left(\frac{11}{2} \times \pi - 16\right)$$

where

$$A = \frac{MajorLength}{2}$$

and

$$B = \frac{MinorLength}{2}$$

Mean Pressure Gradient

The mean pressure gradient measurement (PG mean) in mmHg is proportional to the integral of the square of the Doppler spectral instantaneous velocity ($\mathbf{V_i}$), in centimeters per second, over time ($\mathbf{t_i}$) in seconds. The integral is approximated by the following formula:

$$PG_{mean} = \frac{4}{10,000\,T} \sum_{i=1}^{N} V_i^2 \times t_i$$

where T is the total time interval (the sum of all $\mathbf{t_i}$ time increments), 4 is the approximate units conversion factor for the Bernoulli formula, and 10,000 is the scaling factor from centimeters to meters squared.

Slope

The slope measurement is derived from the length and the time measurement primitives using a simple slope formula.

Velocity

The velocity value is the product of the frequency primitive measurement and the cosine of the angle of blood flow. The blood flow angle is a control set by the system operator. The setting of this control varies by clinical application. There are some uncertainties and assumptions in the setting of this control. Unpredictable high velocity jet directions and tortuous vessel directions sometimes prevent use of a clinically accurate blood flow angle.

Velocity-Time Integral

The velocity-time integral (or flow integral) is the integral of the Doppler spectral instantaneous velocity (V_i) over the total time interval (**T**). The integral is approximated by the following formula:

$$VTI = \sum_{i=1}^{N} V_i \times t_i$$

where **T** is the total time interval (the sum of all t_i time increments).

About PISA Measurements and Calculations

You can perform the following PISA (proximal isovelocity surface area) calculations when you are in PW or CW Doppler and in a cardiac preset:

- MR PISA
- MR flow rate
- MR ERO
- MR volume
- MR RF

In order to perform the calculations above, you need to perform the following measurements:

- MR PISA radius (measured on a full-screen 2D image or a 2D reference image)
- MR max vel
- MR VTI

- MR alias vel
- MV E point
- MV diam 1
- MV diam 2

Note: To perform an MR alias vel, shift the baseline down until aliasing occurs. Then match the color of the isovelocity hemisphere to the color bar and the PRF to the scale. The PRF is the alias velocity.

Formulas Used for Quick Calcs

The following formulas are used to calculate Quick Calcs. See Appendix A for the complete formula and associated references.

- Acceleration Slope
- Area
- Circumference
- D to S Ratio
- Deceleration Slope
- Length
- Pulsatility Index
- Resistivity Index
- S to D Ratio

Formulas Used in Reports

The following formulas are used in reports. See Appendix A for the complete formula and associated references.

- Average Ultrasound Age
- Biophysical Profile Total
- Derived Gestational Age
- EDC(AUA)
- EDC(LMP)

- Weight Percentiles

Doppler Trace

About Doppler Trace

Automatic Doppler trace automatically traces a frozen Doppler spectrum over one heart cycle and uses the trace to calculate and display the results of key Doppler measurements and calculations. Automatic Doppler trace allows you to save time during a patient exam.

In a manual Doppler trace, you manually trace the Doppler spectrum.

On the trace, the system displays the measurement bars that represent three points on the spectrum:

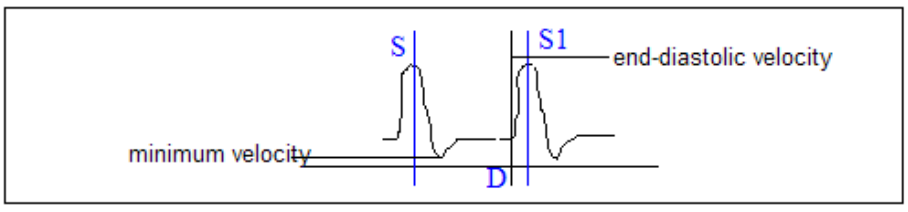
- Systolic (S)
- Diastolic (D)
- Next systolic (S1)

The systemic, diastolic, and mean velocity for this trace are automatically calculated, and the results appear in the results box on the upper right corner of the imaging screen.

Note: Automatic Doppler trace is available only in noncardiac application presets.

About Pulsatility Index and Resistivity Index

Doppler Trace uses the end-diastolic velocity (D)–*not* the minimum velocity, as recommended in some medical sources–to calculate Pulsatility Index and Resistivity Index.



You can manually position the S, D, and S1 bars. If you manually move the D bar to select the minimum velocity in the situation shown in the figure above, PI and RI are calculated according to PI and RI formulas, which use the minimum velocity. However, Acceleration Time (AT), Acceleration Slope (AS), Diastolic/Systolic ratio (D/S), and Systolic/Diastolic ratio (S/D) are now inaccurately reported, since these formulas require use of the end-diastolic rather than the minimum diastolic velocity.

If you want to use the minimum velocity method, you should use your best diagnostic judgment in making and using PI and RI calculations that come from automatic Doppler trace.

You can also use manual Doppler trace to produce PI and RI calculations.

Clinical Sonography - A Practical Guide, 2nd ed., Roger C. Sanders, ed., Little Brown and Company, 1991.

Nanda, Navin D., *Doppler Echocardiography*, 2nd ed., Philadelphia:Lea and Febiger, 1993, p. 29.

Sahn, D., DeMaria, A., Kisslo, J., Weyman, A., The Committee on MMode Standardization of the American Society of Echocardiography, "Recommendations Regarding Quantitation in MMode Echocardiography: Results of a Survey of Echocardiographic Measurements," *Circulation*, 1978, Vol. 58, No. 6, pp. 1072-1083.

Feigenbaum, Harvey, *Echocardiography*, 4th ed., Philadelphia:Lea and Febiger, 1986, pp. 115-122.

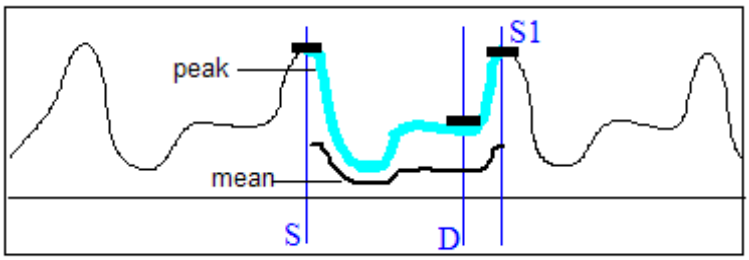
Emamian, S.A., et al., "Kidney Dimensions at Sonography: Correlation With Age, Sex, and Habitus in 665 Adult Volunteers," *American Journal of Radiology*, January 1993, 160:83-86.

About Automatic Doppler Trace

Doppler Trace is intended for use on spectral waveforms that are fully displayed above or below the baseline; for example, in studies of arterial grafts, carotid arteries, umbilical arteries, renal arteries, and transcranial arteries.

When initiated on a frozen Doppler spectrum, Doppler trace automatically detects the strongest Doppler complex in which the first and succeeding systolic points (S and S1) are similar. The system marks the first systolic, the end-diastolic, and the succeeding systolic points with S, D, and S1 measurement bars. A peak trace is drawn in gray

along the top of the waveform. A mean trace (weighted mean or *centroid*) is drawn in black toward the middle of the waveform, marking the predominant velocities encountered in the complex, as shown in the figure below.



The peak trace is used to produce a time-averaged peak velocity measurement (MEAN). The mean trace is used to produce a time-averaged mean velocity measurement (TAVM).

You can use your judgment to manually position the S, D, and S1 points. Moving the S bar to another complex selects that waveform to be automatically traced.

Activating Automatic Doppler Trace

If you want your system to automatically trace a Doppler spectrum by default when you press the **Measure** key, activate Automatic Doppler Trace.

To activate Automatic Doppler Trace:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Measurements** tab.

   The **Measurements** window opens.

3. Select the **Default to Doppler Auto Trace** check box.
4. Click **Apply**.
5. Click **Save**.

Using Automatic Doppler Trace

If you want your system to automatically trace a Doppler spectrum by default when you press the **Measure** key, select the **Doppler Auto Trace** check box on the **Measurements Setup** tab.

Note: Automatic Doppler Trace is not available in cardiac presets.

To use automatic Doppler trace:

1. In PW or CW Spectral Doppler, press the **Freeze** key.
2. Do one of the following:

- If the **Doppler Auto Trace** check box is selected, press the **Measure** key once.
- If the **Doppler Auto Trace** check box is not selected, press the **Measure** key three times.

   The spectrum is automatically traced, measurement bars appear on the spectral trace, and several calculations appear in the results box.

3. (Optional) To display the soft keys, press the **Select** key.
4. (Optional) To show or hide the waveform, press the **Waveform** soft key.
5. To reposition the measurement bars, use the soft keys or press the **Select** key until the name of the measurement bar (**S**, **D**, or **S1**) is highlighted on the bottom right corner of the imaging screen. Use the trackball to move the measurement bar.
6. To approve the measurement and initiate another automatic Doppler trace measurement, press the **Measure** key. To approve the measurement and exit, press the **Enter** key.

   The measurement turns white to indicate that it is complete.

Performing a Manual Doppler Trace Measurement

To perform a manual Doppler trace measurement:

1. In PW or CW Spectral Doppler, press the **Freeze** key and the **Measure** key three times.
2. Press the **Select** key.
3. Move the trackball to trace the waveform.

4. (Optional) To erase the trace one dot at a time, press the **Del** key above the **Measure** key.
5. To approve the measurement and perform another manual Doppler trace measurement, press the **Measure** key. To approve the measurement and exit, press the **Enter** key.

   The measurement turns white to indicate that it is complete.

Using Automatic Doppler Trace Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

D Time: Use the **D Time** soft key to move the D point to the left or to the right.

D Velocity: Use the **D Velocity** soft key to move the D point up or down.

Results Mode: Use the **Results Mode** soft key to display in the result box all measurements currently on the image, the last measurement you performed, or no measurements.

S Time: Use the **S Time** soft key to move the S point to the left or to the right.

S Velocity: Use the **S Velocity** soft key to move the S point up or down.

S1 Time: Use the **S1 Time** soft key to move the S1 point to the left or to the right.

S1 Velocity: Use the **S1 Velocity** soft key to move the S1 point up or down.

Automatic Doppler Trace Measurements

The following table lists the measurements that appear in the results box when an Automatic Doppler Trace is performed:

Label	Units	Type	Meaning
AS	cm/sec2	Acceleration	Acceleration slope
AT	sec	Time	Acceleration time

D	cm/sec	Velocity	Diastolic velocity
MEAN	cm/sec	Velocity	Time-averaged peak velocity
S	cm/sec	Velocity	Systolic velocity
TAVM	cm/sec	Centroid velocity	Time-averaged mean velocity

Automatic Doppler Trace Calculations

The following table lists the calculations that automatically appear in the results box when an Automatic Doppler Trace is performed. See Appendix A for the formula, inherent approximations and assumptions, and clinical references for each calculation.

Label	Formula	Meaning
D/S	D-to-S Ratio	Diastolic to Systolic Ratio
PI	PI	Pulsatility Index
RI	RI	Resistivity Index
S/D	S-to-D Ratio	Systolic to Diastolic Ratio

Measurements

About Measurements

You can perform unlabeled measurements at any time. You can also perform several labeled measurements in each preset. You can specify the measurements available in the **Measurements** menu for each mode and preset.

The measurements available at any one time depend on the preset, the mode, and your system's options. Results of measurements that you perform appear in the results box on the upper right corner of the imaging screen.

After you perform a measurement, press the **Measure** key to approve and save the measurement and initiate another. Press the **Enter** key to approve and save the measurement and exit Measurements. If you press the **Acquire** key, the **Body Mark** key, the **Label** key, or a **Record** key, the measurement is also approved and saved.

Notes:

- When you export a study to an optical disk or over a network, no measurements are saved with your study. You can only view measurements when the study is saved on your system.
- When you press the **Acquire** key, the **Body Mark** key, the **Label** key, or a **Record** key, measurements are saved in the patient report and disappear from the image. To reactive, view, or print a measurement after you press one of those keys, press the **Review** key to enter Image Review.
- When you unfreeze an image, measurements disappear from the image.

About the Accuracy of Measurements and Calculations

You can use the EnVisor Series to provide measurements and calculations derived from ultrasound images. The quantified image data is then used in conjunction with other clinical data to make a diagnosis.

Making a diagnosis based solely on measurement data is not recommended. There are numerous factors to consider when using quantified data from any ultrasound imaging system. A careful analysis of those factors indicates that the accuracy of each measurement and subsequent calculation is highly dependent on image quality. Image quality in turn is highly dependent on system design, operator scanning technique, familiarity with system controls and, most importantly, patient echogenicity. Three of these variables are independent of the system and therefore prevent Philips from specifying a clinical accuracy for the measurements and calculations produced by the system.

About the Sources of Measurement Error

Measurement errors can be caused by several factors, including the following:

Doppler Alignment

Doppler velocity measurements are most accurate when the direction of blood flow is aligned with the acoustic beam axis. Errors due to misalignment are typically about ±5%.

For best accuracy, aim the transducer so that the acoustic beam axis is aligned as closely as possible with blood flow. With linear transducers, when alignment is not possible, use the **Angle** rotary control to compensate.

Formulas

Some formulas used in clinical calculations are based on assumptions or approximations. For example, volume formulas may assume a particular three-dimensional shape. Circumference measurements approximate the actual shape by using a polygon made up of many short line segments.

Height, Weight, and Age Demographics

Height and weight values are manually entered to estimate body surface area for cardiac calculations. Height and weight values can be estimated incorrectly. Moreover, adult weight values can vary over the course of the day. Entering an incorrect age can also result in errors.

Operator Variability

A skilled sonographer can reduce the largest potential component of measurement variability, namely operator variability. With training and experience, a sonographer learns how to acquire the best view and image quality for each type of measurement. Identification of anatomical structures and correct, consistent cursor placement are needed.

Screen Pixel Resolution

The ultrasound screen is composed of an array of (roughly) square picture elements known as pixels. The measurement pixel resolution error is assumed to be ±1 pixel. The pixel error is significant for small dimensions. Using Zoom minimizes pixel resolution error, which is 0.23% (or better) of the full-scale screen.

Speed of Sound

Ultrasound imaging algorithms assume that the speed of sound in tissues is 1540 M/sec. However, the speed of sound varies for different tissues. Within soft tissues, the error is typically within 2% of the speed of sound, but may be as high as 5%, particularly if fatty tissue is present in the measurement area.

Sphygmomanometer Error

Some pressure calculations require manual entry of blood pressure. The system assumes that the pressures you enter are perfect. However, sphygmomanometer errors are typically ±5-10 mmHg.

Sweep Speed

Time measurement errors are larger when slower display sweep speeds are used.

Labeled Measurements

About Labeled Measurements

You choose labeled measurements from the **Measurements** menu. You can perform several labeled calculations in each preset. You can change the measurements available in the **Measurements** menu.

The measurements available at any one time depend on the preset, the mode, and your system's options. Results of measurements that you perform appear in the results box on the upper right corner of the imaging screen. Results of labeled measurements appear in the report.

There are eight types of crosshairs. Each measurement and its corresponding value in the results box are labeled with the same type of crosshair so that you know which value is associated with each measurement.

Performing Labeled Measurements

As you perform labeled measurements, the results of the measurements appear in the results box on the upper right corner of the imaging screen, and the results are saved in the report.

To perform a labeled measurement:

1. Press the **Menu** key above the **Measure** key.

   The **Measurements** menu or the **Calculations** menu appears.

2. If the **Calculations** menu is displayed, press the **Menu** soft key to display the **Measurements** menu.

   In the **Measurements** menu, the current preset appears at the top and a list of measurements appears below.

3. Highlight the measurement you want to perform with the trackball and press the **Enter** key or the **Select** key.

   A crosshair appears on the image.

4. Perform the measurement.

5. To approve the measurement and perform another, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

   The measurement turns white to indicate that it is complete.

Performing Protocol Measurements

When you perform one of the measurements in a set of protocol measurements and press the **Enter** key, the next measurement in the protocol sequence is initiated. If you do not want to perform the next measurement, press the **Del** key above the **Measure** key.

Using Labeled Measurement Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

Explain Text: Use the **Explain Text** soft key to display a short definition of the current measurement. The **Explain Text** soft key is only available when you are performing a labeled measurement.

Fetal ID: Use the **Fetal ID** soft key to identify (by letter) which fetus the measurement applies to. The **Fetal ID** soft key is available only in OB/GYN presets when **Fetal Count** in the **Patient Identification** window equals two or three.

Keyboard Entry: Use the **Keyboard Entry** soft key to enter a measurement value using the keyboard.

Left/Mid/Right: Use the **Left/Mid/Right** soft key to specify the side of the anatomy being measured. The values for the **Left/Mid/Right** soft key depend on the current preset.

Menu: Use the **Menu** soft key to specify whether the **Measurements** or **Calculations** menu appears on the imaging screen.

Menu Hide: Use the **Menu Hide** soft key to hide or display the **Measurements** menu or the **Calculations** menu.

Results Mode: Use the **Results Mode** soft key to display in the result box all measurements currently on the image, the last measurement you performed, or no measurements.

Reactivating a Measurement

You can reactivate a measurement if you want to move the endpoints.

To reactivate a measurement:

1. Press the **Measure** key.

   A crosshair appears.

2. Use the trackball to move the crosshair over an endpoint until the measurement turns orange to indicate that it is active.

3. Press the **Enter key** or the **Select** key.

   The measurement turns blue to indicate that it is active again.

4. Use the trackball to move the endpoint.

5. To approve the measurement and initiate another measurement, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

Deleting a Measurement

To delete a measurement:

1. Press the **Measure** key.

   A crosshair appears.

2. Move the crosshair over the measurement with the trackball until the measurement turns orange to indicate that it is active.

3. Press the **Del** key above the **Measure** key.

   Note: If no crosshair is active, pressing the **Del** key erases all measurements.

About Follicle Measurements

You can perform up to five diameter measurements on each follicle. Only the average appears in the report. All instances appear in the work area.

You can measure up to 15 different follicles in each ovary. For example, **R Follicle 3 Dist** is the diameter of the third follicle in the right ovary.

Performing a Hip Angle Measurement

When performing a hip angle measurement, perform all segments of the measurement from either left to right or right to left.

The first point of each line, depicted by a caliper, represents the source of the line. The second point, depicted by the arrow, represents the end of the line. When the hip angle measurement is complete, the arrows on each line should point the same direction.

- The first line you create is the baseline reference line.
- The second line is the alpha reference line.
- The third line is the beta reference line.

To readjust an endpoint, press the **Select** key to choose the endpoint and use the trackball.

To perform a hip angle measurement:

1. Press the **Menu** key.
2. Select the hip angle measurement.
3. Place the first caliper on the hip.

4. Press the **Measure** key.
5. Place the second caliper on the distal end of the femur toward the knee.
6. Press the **Measure** key.
7. Place the third caliper above the baseline.
8. Press the **Measure** key.
9. Place the fourth caliper below the baseline to create the alpha angle.

   Note: The two lines must intersect.
10. Press the **Measure** key.
11. Place the fifth caliper below the baseline.
12. Press the **Measure** key.
13. Place the sixth caliper above the baseline to create the beta angle.

    Note: The two lines must intersect.
14. Press the **Enter** key to complete the measurement.

    The **Hip Angle-Alpha** and **Hip Angle-Beta** measurements appear in the results box.

Labeled Measurements by Exam Type

About Labeled Measurements by Exam Type

All labeled measurements are listed by exam type in the topics in this book. Information about each measurement, such as units, measurement type, and meaning, is included in the tables.

Instructions for performing the measurements are not included in the tables.

Abdominal Measurements

All abdominal measurements are listed in the following tables, which appear in alphabetical order:

% Stenosis Measurements

Label	Type	Meaning
Aortic Area 1	Area	True or residual area
Aortic Area 2	Area	True or residual area
Aortic Diam 1	Distance	True or residual diameter
Aortic Diam 2	Distance	True or residual diameter
Area 1	Area	True or residual area
Area 2	Area	True or residual area
Diam 1	Distance	True or residual diameter
Diam 2	Distance	True or residual diameter
Renal Artery Area 1	Area	True or residual area
Renal Artery Area 2	Area	True or residual area
Renal Artery Diam 1	Distance	True or residual diameter
Renal Artery Diam 2	Distance	True or residual diameter

A/B Velocity Ratio Measurements

Label	Units	Type	Meaning
Aortic Velocity A	cm/s	Velocity	Generic velocity
Aortic Velocity B	cm/s	Velocity	Generic velocity
Renal Artery Velocity A	cm/s	Velocity	Generic velocity
Renal Artery Velocity B	cm/s	Velocity	Generic velocity
Velocity A	cm/s	Velocity	Generic velocity
Velocity B	cm/s	Velocity	Generic velocity

Flow Volume Measurements

Label	Units	Type	Meaning
Aortic Flow Diam	cm	Distance	Flow volume's diameter
Aortic Mean Vel	cm/s	Mean velocity	Flow volume's mean velocity
Flow Diam	cm	Distance	Flow volume's diameter
Mean Vel	cm/s	Mean velocity	Flow volume's mean velocity
Renal Artery Flow Diam	cm	Distance	Flow volume's diameter
Renal Artery Mean Vel	cm/s	Mean velocity	Flow volume's mean velocity

RAR Measurements

Label	Units	Type	Meaning
Ao SV	cm/s	Max velocity	Aortic systolic velocity
RA SV	cm/s	Max velocity	Renal systolic velocity

Resistivity Index and Pulsatility Index Measurements

Label	Units	Type
Aortic Mean V (PI)	cm/s	Velocity
Aortic MnV	cm/s	Velocity
Aortic MxV	cm/s	Velocity
Mean V (PI)	cm/s	Velocity

MnV	cm/s	Velocity
MxV	cm/s	Velocity
Renal Artery Mean V (PI)	cm/s	Velocity
Renal Artery MnV	cm/s	Velocity
Renal Artery MxV	cm/s	Velocity

Volume Measurements

Label	Units	Type	Meaning
Aortic Distance 1	cm	Distance	Height, length, or width
Aortic Distance 2	cm	Distance	Height, length, or width
Aortic Distance 3	cm	Distance	Height, length, or width
Distance 1	cm	Distance	Height, length, or width
Distance 2	cm	Distance	Height, length, or width
Distance 3	cm	Distance	Height, length, or width
Renal Distance 1	cm	Distance	Height, length, or width
Renal Distance 2	cm	Distance	Height, length, or width
Renal Distance 3	cm	Distance	Height, length, or width

Cardiac Measurements

All cardiac measurements are listed in the following tables, which appear in alphabetical order:

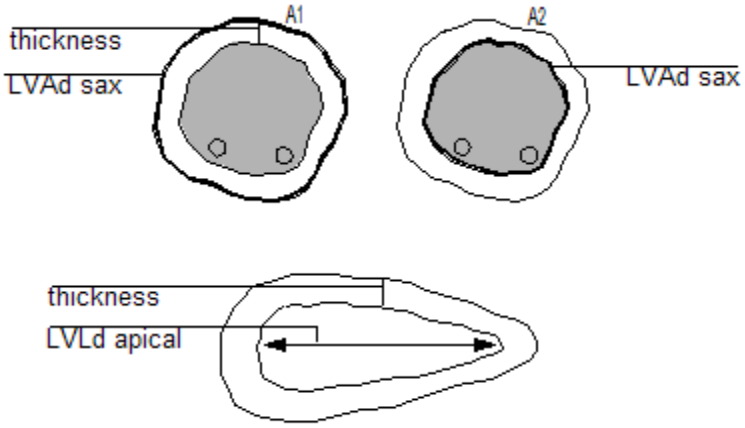
2D Mode Measurements

Label	Units	Type	Meaning
IVSd	cm	Height	Interventricular septal dimension at end diastole
IVSs	cm	Height	Interventricular septal dimension at end systole
Left diam	cm	Length	Flow diameter on left side of heart
LVAd ap2	cm^2	Area	Left ventricular long axis area at end diastole, apical two-chamber
LVAd ap4	cm^2	Area	Left ventricular long axis area at end diastole, apical four-chamber
LVAd apical	cm^2	Area	Left ventricular area at end diastole, apical
LVAd sax epi	cm^2	Area	Left ventricular short axis area at epicardium at end diastole
LVAd sax MV	cm^2	Area	Left ventricular short axis area at mitral valve level at end diastole
LVAd sax PM	cm^2	Area	Left ventricular short axis area at papillary muscle level at end diastole

LVAs ap2	cm^2	Area	Left ventricular long axis area at end systole, apical two-chamber
LVAs ap4	cm^2	Area	Left ventricular long axis area at end systole, apical four-chamber
LVAs apical	cm^2	Area	Left ventricular area at end systole, apical
LVAs sax MV	cm^2	Area	Left ventricular short axis area at mitral valve level at end systole
LVAs sax PM	cm^2	Area	Left ventricular short axis area at papillary muscle level at end systole
LVIDd	cm	Height	Left ventricular internal diameter at end diastole
LVIDs	cm	Height	Left ventricular internal diameter at end systole
LVLd apical	cm	Length	Left ventricular length at end diastole, apical
LVLs apical	cm	Length	Left ventricular length at end systole, apical
LVOT diam	cm	Length, height	Left ventricular outflow tract diameter

LVPWd	cm	Height	Left ventricular posterior wall dimension at end diastole
LVPWs	cm	Height	Left ventricular posterior wall dimension at end systole
MM R-R int	sec	Time	MMode or 2D R-R interval
MR PISA radius	cm	Length	Alias radius of the proximal convergence zone of the mitral valve regurgitation
MV diam 1	cm	Length	Mitral valve diameter 1
MV diam 2	cm	Length	Mitral valve diameter 2
Right diam	cm	Length	Flow diameter on right side of heart
RVAWd	cm	Height	Right ventricular wall dimension at end diastole
RVDd	cm	Height	Right ventricular internal diameter at end diastole

LVAd sax epi, LVAd sax PM, and LVLd apical



Doppler Demographics

Label	Units	Meaning
RA press	mmHg	Estimated Right Atrial Pressure

Doppler Measurements

Label	Units	Type	Meaning
AI max PG	mmHg	Pressure gradient	Aortic insufficiency maximum pressure gradient
AI max vel	cm/s	Maximum velocity	Maximum velocity of aortic insufficiency
Ao dec slope	cm/s^2	Acceleration	Aortic insufficiency deceleration slope
Ao max PG	mmHg	Pressure gradient	Aortic flow maximum pressure gradient
Ao mean PG	mmHg	Pressure gradient	Aortic flow mean pressure gradient
Ao V2 max	cm/s	Maximum velocity	Maximum velocity for continuity formula
Ao V2 VTI	cm	Velocity time integral	Velocity time integral 2 for continuity formula
Aortic R-R	sec	Time	R-R interval measured when making measurements on the aortic valve

Left max vel	cm/s	Maximum velocity	Maximum flow volume on left side of heart
LV mean PG	mmHg	Pressure gradient	Left ventricular mean pressure gradient
LV V1 max	cm/s	Maximum velocity	Maximum velocity for continuity formula at "2D diam"
LV V1 VTI	cm	Velocity time integral	Velocity time integral 1 for continuity at "2D diam"
LVOT diam	cm	Length, height	Left ventricular outflow tract diameter
MR alias vel	cm/s	Maximum velocity	Aliasing velocity of the proximal convergence zone of the mitral valve regurgitation
MR max PG	mmHg	Pressure gradient	Mitral regurgitation maximum pressure gradient
MR mean PG	mmHg	Pressure gradient	Mitral regurgitation mean pressure gradient
MR max vel	cm/s	Maximum velocity	Maximum velocity of mitral regurgitation
MR mean vel	cm/s	Mean velocity	Mean velocity of the mitral valve regurgitant flow

MR VTI	cm	Velocity time integral	Velocity time integral of the mitral valve regurgitant flow
MV A point	cm/s	Maximum velocity	Mitral valve A point maximum velocity
MV dec slope	cm/s^2	Acceleration	Mitral valve deceleration slope
MV E point	cm/s	Maximum velocity	Mitral valve E point maximum velocity
MV P1/2t max v	cm/s	Maximum velocity	Mitral valve maximum velocity for P1/2t
MV V2 VTI	cm	Velocity time integral	Velocity time integral based on flow distal to the mitral valve
PA dec slope	cm/s^2	Acceleration	Pulmonic deceleration slope
PA max PG	mmHg	Pressure gradient	Pulmonary artery maximum pressure gradient
PA V2 max	cm/s	Maximum velocity	Maximum velocity measured distal to the pulmonary artery with CW Doppler
PI max PG	mmHg	Pressure gradient	Pulmonic insufficiency maximum pressure gradient

PI max vel	cm/s	Maximum velocity	Maximum velocity of pulmonic insufficiency
Right max vel	cm/s	Maximum velocity	Maximum flow volume on right side of heart
TR max vel	cm/s	Maximum velocity	Maximum velocity of the tricuspid valve regurgitation

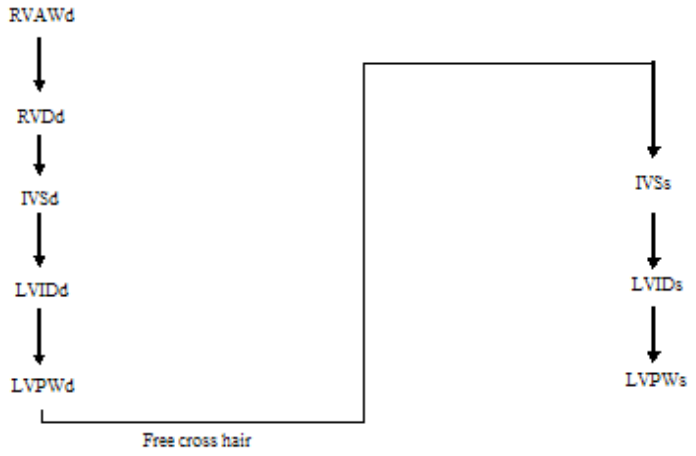
MMode Measurements

Label	Units	Type	Meaning
ACS	cm	Height	Aortic cusp separation
Ao root diam	cm	Height	Aortic root diameter
Aortic R-R	sec	Time	R-R interval measured when making measurements on the aortic valve
EPSS	cm	Height	E point septal separation
IVSd	cm	Height	Interventricular septal dimension at end diastole
IVSs	cm	Height	Interventricular septal dimension at end systole
LA dimension	cm	Height	Left atrial dimension
LVIDd	cm	Height	Left ventricular internal diameter at end diastole
LVIDs	cm	Height	Left ventricular internal diameter at end systole
LVPWd	cm	Height	Left ventricular posterior wall dimension at end diastole

LVPWs	cm	Height	Left ventricular posterior wall dimension at end systole
MM R-R int	sec	Time	MMode or 2D R-R interval
MV E-F slope	cm/s	MM slope	Mitral valve E-F slope
MV excursion	cm	Height	Mitral valve excursion
RVAWd	cm	Height	Right ventricular wall dimension at end diastole
RVDd	cm	Height	Right ventricular internal diameter at end diastole

MMode also supports the following protocol measurements. These are measurements that are made one after the other, usually occurring in a single slice of the anatomy.

MMode Protocol Measurements



Cardiac Meta-Measurements

A number of meta-measurements are supported in the Cardiac exam type. When these measurements are performed, a number of child measurement values are generated and displayed in the results box. Only the child measurements, however, are displayed in the report.

All cardiac meta-measurements are listed in the following table with their corresponding child measurements:

Meta-Measurement	Child Measurements
AI max	AI max PG
	AI max vel
Ao max	Ao max PG
	Ao V2 max

Ao V2 Trace	Ao max PG
	Ao mean PG
	Ao V2 max
	Ao V2 VTI
LV V1 Trace	LV mean PG
	LV V1 max
	LV V1 VTI

LVAd ap2 MOD	EDV(MOD-sp2)
	LVAd ap2
	LVAd apical
	LVLd apical
LVAd ap4 MOD	EDV(MOD-sp4)
	LVAd ap4
	LVAd apical
	LVLd apical

LVAs ap2 MOD	ESV(MOD-sp2)
	LVAs ap2
	LVAs apical
	LVLs apical
LVAs ap4 MOD	ESV(MOD-sp4)
	LVAs ap4
	LVAs apical
	LVLs apical
MR max	MR max vel
	MR max PG

PA max	PA max PG
	PA V2 max
PI max	PI max PG
	PI max vel

OB/GYN Measurements

All OB/GYN measurements are listed in the following table:

Label	Units	Type	Meaning
2 Beat Pk-to-Pk	sec	Time	Two beat peak-to-peak time interval
AC traced	cm	Circumference	Traced abdominal circumference
ADap	cm	Length	Anterior-posterior abdominal diameter
ADtrv	cm	Length	Transverse abdominal diameter
BPD	cm	Length	Biparietal diameter
CD	cm	Length	Cerebellar diameter
Cervix	cm	Contour length	Cervical length

Cist Mag	cm	Length	Cisterna magna
CLAV	cm	Length	Clavicle length
CRL	cm	Length	Crown rump length
Distance 1	cm	Length	Three-axis volume length
Distance 2	cm	Length	Three-axis volume length
Distance 3	cm	Length	Three-axis volume length
DuctusVenosus DV	cm/s	Velocity	Measure the diastolic velocity of the ductus venosus
DuctusVenosus Mean (PI)	cm/s	Velocity	Measure the mean velocity of the ductus venosus
DuctusVenosus SV	cm/s	Velocity	Measure the systolic velocity of the ductus venosus
DV	cm^2	Velocity	Measure the diastolic velocity (for the PI and RI calculation)
Ear	cm	Length	Ear length
Endometrium	cm	Length	Endometrial thickness
FIB	cm	Length	Fibula length
FL	cm	Length	Femur length
Flow diam	cm	Length	Diameter for flow volume
Foot	cm	Length	Foot length

FTA traced	cm^2	Area	Traced fetal trunk cross-sectional area
GSD1	cm	Length	Gestational sac diameter one
GSD2	cm	Length	Gestational sac diameter two
GSD3	cm	Length	Gestational sac diameter three
HC traced	cm	Circumference	Traced head circumference
HL	cm	Length	Humerus length
IOD	cm	Length	Inner orbital diameter
L Follicle (1-16) Dist	cm	Length	Diameter of left ovarian follicle (1-16)
L ovary DV	cm/s	Velocity	Left ovary diastolic velocity
L ovary Mean (PI)	cm/s	Velocity	Left ovary mean velocity
L ovary SV	cm/s	Velocity	Left ovary systolic velocity
Lat V	cm	Length	Lateral ventricle width
LOH	cm	Length	Left ovarian height
LOL	cm	Length	Left ovarian length
LOW	cm	Length	Left ovarian width
M Phalanx 5	cm	Length	Length of the middle phalanx on the fifth digit
Mean (PI)	cm/s	Velocity	Mean velocity

Mean vel	cm/s	Velocity	Mean velocity for flow volume
NUCH	cm	Length	Nuchal thickness
OFD	cm	Length	Occipito-frontal diameter
OOD	cm	Length	Outer orbital diameter
Orbit 1	cm	Length	First orbit
Orbit 2	cm	Length	Second orbit
QUAD1	cm	Length	AFI dimension: quadrant 1
QUAD2	cm	Length	AFI dimension: quadrant 2
QUAD3	cm	Length	AFI dimension: quadrant 3
QUAD4	cm	Length	AFI dimension: quadrant 4
R Follicle (1-16) Dist	cm	Length	Diameter of right ovarian follicle (1-16)
R ovary DV	cm/s	Velocity	Right ovary diastolic velocity
R ovary Mean (PI)	cm/s	Velocity	Right ovary mean velocity
R ovary SV	cm/s	Velocity	Right ovary systolic velocity
Renal AP	cm	Length	Renal width
Renal L	cm	Length	Renal length
RL	cm	Length	Radius length
ROH	cm	Length	Right ovarian height

ROL	cm	Length	Right ovarian length
ROW	cm	Length	Right ovarian width
SL	cm	Length	Spine length
SV	cm^2	Velocity	Measure the systolic velocity (for the PI and RI calculation)
TC traced	cm	Circumference	Traced thoracic circumference
TDap	cm	Length	Anterior-posterior thoracic diameter
TDtrv	cm	Length	Transverse thoracic diameter
TL	cm	Length	Tibia length
TTD	cm	Length	Transverse trunk diameter
UL	cm	Length	Ulna length
Umbilical DV	cm/s	Velocity	Measure the diastolic velocity of the umbilical artery
Umbilical Mean (PI)	cm/s	Velocity	Measure the mean velocity of the umbilical artery
Umbilical SV	cm/s	Velocity	Measure the systolic velocity of the umbilical artery
Uterine DV	cm/s	Velocity	Measure the diastolic velocity of the uterine artery
Uterine Mean (PI)	cm/s	Velocity	Measure the mean velocity of the uterine artery

Uterine SV	cm/s	Velocity	Measure the systolic velocity of the uterine artery
UTH	cm	Length	Uterine height
UTL	cm	Length	Uterine length
UTW	cm	Length	Uterine width
Velocity A	cm/s	Velocity	Generic velocity
Velocity B	cm/s	Velocity	Generic velocity

Vascular Measurements

All vascular measurements are listed in the following tables, which appear in alphabetical order:

% Stenosis Measurements

Label	Units	Type	Meaning
Area 1	cm^2	Area	True or residual area
Area 2	cm^2	Area	True or residual area
Diam 1	cm	Length	True or residual diameter
Diam 2	cm	Length	True or residual diameter

3-Axis Volume Measurements

Label	Units	Type	Meaning
Distance 1	cm	Length	Height, length, or width
Distance 2	cm	Length	Height, length, or width
Distance 3	cm	Length	Height, length, or width

A/B Velocity Ratio Measurements

Label	Units	Type	Meaning
Velocity A	cm/s	Velocity	Generic velocity
Velocity B	cm/s	Velocity	Generic velocity

Carotid Measurements

Label	Units	Type	Meaning
CCA DV	cm/s	Maximum velocity	Common carotid artery diastolic velocity
CCA SV	cm/s	Maximum velocity	Common carotid artery systolic velocity
ECA DV	cm/s	Maximum velocity	External carotid artery diastolic velocity
ECA SV	cm/s	Maximum velocity	External carotid artery systolic velocity
ICA DV	cm/s	Maximum velocity	Internal carotid artery diastolic velocity
ICA SV	cm/s	Maximum velocity	Internal carotid artery systolic velocity
SCA DV	cm/s	Maximum velocity	Subclavian artery diastolic velocity
SCA SV	cm/s	Maximum velocity	Subclavian artery systolic velocity
VA DV	cm/s	Maximum velocity	Vertebral artery diastolic velocity
VA SV	cm/s	Maximum velocity	Vertebral artery systolic velocity

Flow Volume Measurements

Label	Units	Type	Meaning
Flow diam	cm	Length	Flow diameter for flow volume
Mean vel	cm/s	Mean velocity	Mean velocity for flow volume

Resistivity Index and Pulsatility Index Measurements

Label	Units	Type
CCA Mean V (PI)	cm/s	Velocity
CCA MnV	cm/s	Velocity
CCA MxV	cm/s	Velocity
ECA Mean V (PI)	cm/s	Velocity
ECA MnV	cm/s	Velocity
ECA MxV	cm/s	Velocity
ICA Mean V (PI)	cm/s	Velocity
ICA MnV	cm/s	Velocity
ICA MxV	cm/s	Velocity
SCA Mean V (PI)	cm/s	Velocity
SCA MnV	cm/s	Velocity
SCA MxV	cm/s	Velocity
VA Mean V (PI)	cm/s	Velocity
VA MnV	cm/s	Velocity
VA MxV	cm/s	Velocity

Unlabeled Measurements

About Unlabeled Measurements

You can perform five types of unlabeled measurements:

- 1-point velocity or 1-point depth
- 2-point
- Ellipse
- Method of Disks
- Trace

Results of unlabeled measurements that you perform appear in the results box on the upper right corner of the imaging screen. Results of unlabeled measurements are not saved in the report, but do appear in the work area in Image Review.

Quick Calcs are common calculations that are computed automatically as unlabeled measurements are made. Quick Calc results appear in the results box.

Note: You must perform a measurement within a single calibration region. A dashed line called a *calibration line* in an MMode trace or a spectral Doppler trace separates distinct calibration regions. Measurements cannot cross a calibration line.

Performing a 1-Point Depth or Velocity Measurement

If you are not in MMode or in a physio trace when you initiate a measurement, a 1-point depth measurement or a 1-point velocity measurement automatically appears in the results box.

As you perform unlabeled measurements, the results of the measurements and of the associated Quick Calcs appear in the results box on the upper right corner of the imaging screen.

Note: If **Default to Doppler Auto Trace** is selected on the **Measurements Setup** tab, press the **Select** key to obtain a 1-point measurement.

To perform a 1-point depth or velocity measurement:

1. Press the **Measure** key.

   A caliper appears on the image.

- If the caliper is in a 2D image, a 1-point depth measurement appears in the results box.
- If the caliper is in a spectral trace, a 1-point velocity measurement appears in the results box.

   Note: If the caliper is in a frozen spectral trace and you are in a noncardiac preset, you must press the **Measure** key again for the 1-point velocity measurement to appear in the results box.

2. To approve the 1-point depth or velocity measurement and initiate another measurement, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

Performing a 2-Point Measurement

You can perform a 2-point (linear) measurement to measure the length of a structure or a length of time. As you perform unlabeled measurements, the results of the measurements and of the Quick Calcs appear in the results box on the upper right corner of the imaging screen.

To perform a 2-point measurement:

1. Press the **Measure** key.

   A caliper appears on the imaging screen. The measurement appears in blue to indicate that it is active.

2. Use the trackball to position the caliper.
3. Press the **Select** key.

   A second caliper appears on the imaging screen.

4. Use the trackball to position the second caliper.
5. (Optional) To reposition a caliper, press the **Select** key repeatedly until the caliper that you want to move is highlighted on the bottom right corner of the imaging screen. Move the trackball to move the caliper.

6. To approve the measurement and initiate another measurement, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

   The measurement turns white to indicate that it is complete.

Performing an Ellipse Measurement

You can perform an ellipse measurement on a 2D image to measure a volume. As you perform unlabeled measurements, the results of the measurements and of the associated Quick Calcs appear in the results box on the upper right corner of the imaging screen.

To perform an ellipse measurement on a 2D image:

1. Press the **Measure** key twice.

   An ellipse appears on the imaging screen. The measurement appears in blue to indicate that it is active.

2. Use the trackball to position the second endpoint.
3. Press the **Select** key until **AXIS** is highlighted on the bottom right corner of the imaging screen. Adjust the width of the ellipse with the trackball.
4. (Optional) To reposition an endpoint or to change the width of the ellipse, press the **Select** key repeatedly until the part of the measurement you want to change is highlighted on the bottom right corner of the imaging screen. Move the trackball to make the change.
5. To approve the measurement and initiate another measurement, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

   The measurement turns white to indicate that it is complete.

Performing a Trace Measurement

You can perform a trace measurement to measure the volume of an irregularly shaped area. As you perform unlabeled measurements, the results of the measurements and of the associated Quick Calcs appear in the results box on the upper right corner of the imaging screen.

To perform a trace measurement:

1. Press the **Measure** key three times.

   A caliper appears on the imaging screen. The measurement appears in blue to indicate that it is active.

2. Press the **Select** key.

   Manual is highlighted on the bottom right corner of the imaging screen.

3. Move the trackball to trace the region that you want to measure.
4. (Optional) To erase the trace one dot at a time, press the **Del** key above the **Measure** key.
5. To approve the measurement and perform another measurement, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

   If you do not create an enclosed region, the traced area will automatically be closed.

   The measurement turns white to indicate that it is complete.

Performing a Method of Disks Measurement

You can perform a Method of Disks measurement to measure the volume of an irregularly shaped area. As you perform unlabeled measurements, the results of the measurements and of the associated Quick Calcs appear in the results box on the upper right corner of the imaging screen.

To perform a Method of Disks measurement:

1. Press the **Measure** key three times.
2. Press the **Select** key.

   Manual is highlighted on the bottom right corner of the imaging screen.

   A caliper appears on the imaging screen. The measurement appears in blue to indicate that it is active.

3. Move the trackball to trace the region that you want to measure.
4. (Optional) To erase the trace one dot at a time, press the **Del** key above the **Measure** key.
5. Press the **Select** key.

   MOD is highlighted on the bottom right corner of the imaging screen.
6. Position the long axis with the trackball.
7. To approve the measurement and perform another measurement, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

   The measurement turns white to indicate that it is complete.

Choosing Quick Calcs

You can specify which Quick Calcs appear in the results box on the upper right corner of the imaging screen for the current preset.

To choose which Quick Calcs appear in the results box:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Measurements** tab.

   The **Measurements** window opens.
3. Click **2D**, **MMode**, or **Doppler** to specify the Quick Calcs that appear when you are in that mode.
4. Select the check boxes for the Quick Calcs that you want to see in the results box for the current preset when you are in the specified mode.
5. Click **Apply**.
6. Click **OK**.
7. Click **Apply**.
8. Click **Close**.

Obtaining an RI Calculation and an S/D Ratio

To obtain an RI calculation and an SD ratio, you need to perform a 2-point measurement on a waveform.

1. Acquire a waveform.
2. Press the **Measure key**.
3. Use the trackball to place the first caliper on systole.
4. Press the **Select** key to highlight **Endpt 2** on the bottom right corner of the imaging screen.
5. Use the trackball to place the second caliper on diastole.

   The Time, S/D Ratio, and RI appear in the results box.
6. To approve the measurement and initiate another measurement, press the **Measure** key. To approve the measurement and exit Measurements, press the **Enter** key.

Calculations

About Calculations

You can perform many calculations in each preset. You can change the calculations available in the **Calculations** menu, and you can create your own calculations for OB/GYN presets.

The calculations available at any one time depend on the preset, the mode, and the options installed on your system.

Measurements that you perform, and any resulting calculations, appear in the results box on the upper right corner of the imaging screen.

Performing Calculations

To perform a calculation:

1. Press the **Menu** key above the **Measure** key.

   The **Measurements** menu or the **Calculations** menu appears.

2. If the **Measurements** menu is displayed, press the **Menu** soft key to display the **Calculations** menu.

   In the **Calculations** menu, the current preset appears at the top and a list of calculations appears below.

3. Highlight the measurement you want to perform with the trackball and press the **Enter** key or the **Select** key.

   A list of the measurements and calculations that you need to perform for the selected calculation appears.

4. Select and perform each of the measurements or calculations on the list. You can perform them in any order.

Creating a User-Defined Calculation Using a Formula

When you are in an OB/GYN preset, you can create a calculation using a formula. You can add calculations that you create to the **Calculations** menu for OB/GYN presets.

Notes:

- You must define a GA calculation so that the answer is displayed in weeks. You must define a GA range calculation so that the answer is displayed in days.
- You cannot define range calculations for fetal weight or for ratio.

To create a user-defined calculation using a formula:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Analysis** tab.

   The **Analysis** window opens.

3. Click **User Defined Calculations**.

   The **Calculation Editor** window opens.

4. Click **New Calculation**.
5. Type the name of the calculation in the **Calculation Name** field.
6. Specify the **Calculation Type** using the drop-down menu.
7. Specify whether the formula is a **Calculation** or **Range** (**days**) using the option buttons.
8. Generate the formula by clicking the keypad to place numbers and mathematical operators in the formula. Select inputs to the formula from the **Inputs** menu.
9. Click **OK**.
10. Click **Apply**.
11. Click **Close**.

Creating a User-Defined Calculation Using a Table

When you are in an OB/GYN preset, you can create a calculation using a table. You can add calculations that you create to the **Calculations** menu for OB/GYN presets.

To create a user-defined calculation using a table:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Analysis** tab.

   The **Analysis** window opens.

3. Click **User Defined Tables**.

   The **Gestational Age Table Editor** window opens.

4. Click **New Table**.
5. Type the name of the calculation in the **Author's Name** dialog box.
6. Choose the biometry from the **Biometry** drop-down menu.

7. Indicate how the age should be displayed by selecting the **Weeks and Days** or the **Days** option button.
8. Type values in the **Measurement**, **GA**, and **Range** columns.

- Click a table cell to type a value.
- Use the **Tab** key or the arrow keys to move between table cells.
- To remove all of the values in the table, click **Clear Table**.
- To add a row above the current row, click **Insert Row**.
- To delete the current row, click **Delete Row**.

9. Click **OK**.
10. Click **Apply**.
11. Click **Close**.

Editing a User-Defined Calculation

After you create a GA calculation using a formula or a table, you can modify the calculation.

To edit a user-defined calculation:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Analysis** tab.

   The **Analysis** window opens.
3. Click **User Defined Calculations** or **User Defined Tables**.

   The **Calculation Editor** or **Gestational Age Table Editor** window opens.
4. Select the calculation you want to edit from the **Calculation Name** or the **Table Name** drop-down menu.
5. Click **Edit Calculation** or **Edit Table**.
6. Make any necessary changes to the calculation.
7. Click **OK**.

8. Click **Apply**.
9. Click **Close**.

Deleting a User-Defined Calculation

You can delete a GA calculation that you created using a formula or a table.

To delete a user-defined calculation:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Analysis** tab.

   The **Analysis** window opens.
3. Click **User Defined Calculations** or **User Defined Tables**.

   The **Calculation Editor** or **Gestational Age Table Editor** window opens.
4. Select the calculation you want to delete from the **Calculation Name** or the **Table Name** drop-down menu.
5. Click **Delete Calculation** or **Delete Table**.
6. To confirm, click **OK**.
7. Click **OK**.
8. Click **Apply**.
9. Click **Close**.

About Volume Calculations

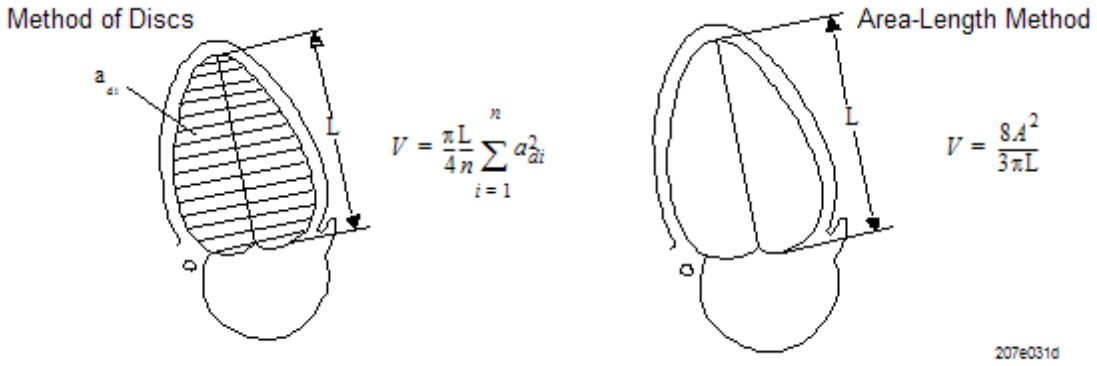
The methods used to calculate cardiac volumes and radiological volumes are described below.

Cardiac Volumes

You can calculate cardiac volumes in two ways:

- Method of Discs (MOD)
  - Single-plane method

  – Biplane method
- Area-Length Method (Non-MOD)



Method of Discs

The Method of Discs (MOD) single-plane volume calculation uses one orthogonal plane for area (the apical four-chamber view or the apical two-chamber view) and a long-axis length. The area traces are divided into 20 elliptical disk segments. The MOD biplane volume calculation uses two orthogonal-plane area traces (the two-chamber apical view and the four-chamber apical view) and a long-axis length (the longer of the two long axes). The area traces are divided into 20 elliptical disk segments.

Area-Length Method

The non-MOD single-plane ellipse, biplane ellipse, and Bullet volume calculations use the Area-Length Method, which uses apical measurements. When a two-chamber or a four-chamber measurement is made, the area values are copied into the equivalent generic apical measurement using the meta-measurement feature. However, generic apical measurements are not copied back into either the two-chamber view or the four-chamber view measurements.

Three-Distance Volumes

For radiology and other applications, volumes of solids are calculated using the following formula:

$$\text{Length} \times \text{Width} \times \text{Height} \times 0.523$$

One-Distance Volumes

Follicular volumes are one-distance volumes. They are calculated using the following formula:

0.523 X D X D X D

where D = follicular distance

Calculations by Exam Type

About Calculations by Exam Type

All calculations are listed by exam type in the topics in this book. The tables include the type and the meaning of the calculation. Instructions for performing the calculations are not included in the tables.

See Appendix A for the formula, inherent approximations and assumptions, and clinical references for each calculation.

Abdominal Vascular Calculations

All abdominal vascular calculations are listed in the following tables, which appear in alphabetical order. See Appendix A for the formula, inherent approximations and assumptions, and clinical references for each calculation.

% Stenosis Calculations

Label	Formula	Type	Meaning
% Area sten	% Area Stenosis	%	Percent area stenosis
% Diam sten	% Diameter Stenosis	%	Percent diameter stenosis
Aortic % Area sten	% Area Stenosis	%	Percent area stenosis
Aortic % Diam sten	% Diameter Stenosis	%	Percent diameter stenosis
Renal Artery % Area sten	% Area Stenosis	%	Percent area stenosis
Renal Artery % Diam sten	% Diameter Stenosis	%	Percent diameter stenosis

Flow Volume Calculations

Label	Formula	Type	Meaning
Aortic flow vol	Flow Volume (Diameter)	Volume	Flow volume via diameter
Flow vol	Flow Volume (Diameter)	Volume	Flow volume via diameter
Renal Artery flow vol	Flow Volume (Diameter)	Volume	Flow volume via diameter

Resistivity Index and Pulsatility Index Calculations

Label	Formula	Type
Aortic RI	RI	Resistivity index
Aortic PI	PI	Pulsatility index using time-averaged mean of the peaks

Renal Artery RI	RI	Resistivity index
Renal Artery PI	PI	Pulsatility index using time-averaged mean of the peaks
RI	RI	Resistivity index
PI	PI	Pulsatility index using time-averaged mean of the peaks

Velocity Ratios Calculations

Label	Formula	Type	Meaning
A/B	A-to-B Ratio	Ratio	Generic A/B velocity ratio
Aortic A/B	A-to-B Ratio	Ratio	Generic A/B velocity ratio
Aortic RAR	Systolic Ratio	Ratio	Renal aortic systolic velocity ratio
RAR	Systolic Ratio	Ratio	Renal aortic systolic velocity ratio
Renal Artery A/B	A-to-B Ratio	Ratio	Generic A/B velocity ratio
Renal Artery RAR	Systolic Ratio	Ratio	Renal aortic systolic velocity ratio

Volume Calculations

Label	Formula	Type	Meaning
Aortic Volume	Volume (Ellipsoid Three-Axis)	Volume	Ellipsoid three-axis volume
Renal Volume	Volume (Ellipsoid Three-Axis)	Volume	Ellipsoid three-axis volume
Volume	Volume (Ellipsoid Three-Axis)	Volume	Ellipsoid three-axis volume

Angle Calculations

All angle calculations are listed in the following table. See Appendix A for the formula, inherent approximations and assumptions, and clinical references for each calculation.

Label	Formula	Type	Meaning
Hip angle α	Angle	Angle in degrees	Bony acetabular root line angle (bony root angle)
Hip angle β	Angle	Angle in degrees	Cartilage root line angle (cartilage root angle)

Cardiac Calculations

All cardiac calculations are listed in the following tables, which appear in alphabetical order. See Appendix A for the formula, inherent approximations and assumptions, and clinical references for each calculation.

2D Mode Calculations

Label	Formula	Type	Meaning
CO(bp-el)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(Bullet)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(Cubed)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(MOD-bp)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(mod-Simp)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(MOD-sp2)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(MOD-sp4)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(sp-el)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
CO(Teich)	CO (Cardiac Output) (2D)	Cardiac output	Cardiac output (2D)
EDV(bp-el)	EDV	Volume	Volume (biplane)
EDV(Bullet)	EDV	Volume	Volume (bullet)
EDV(Cubed)	EDV	Volume	Volume (cubed)
EDV(MOD-bp)	EDV	Volume	Volume (biplane MOD)
EDV(mod-Simp)	EDV	Volume	Volume (mod-Simp)
EDV(MOD-sp2)	EDV	Volume	Volume (single-plane, 2-chamber MOD)

EDV(MOD-sp4)	EDV	Volume	Volume (single-plane, 4-chamber MOD)
EDV(sp-el)	EDV	Volume	Volume (single-plane ellipse)
EDV(Teich)	EDV	Volume	Volume (Teich)
EF(bp-el)	EF (Ejection Fraction)	EF	Ejection fraction
EF(Bullet)	EF (Ejection Fraction)	EF	Ejection fraction
EF(Cubed)	EF (Ejection Fraction)	EF	Ejection fraction
EF(MOD-bp)	EF (Ejection Fraction)	EF	Ejection fraction
EF(mod-Simp)	EF (Ejection Fraction)	EF	Ejection fraction
EF(MOD-sp2)	EF (Ejection Fraction)	EF	Ejection fraction
EF(MOD-sp4)	EF (Ejection Fraction)	EF	Ejection fraction
EF(sp-el)	EF (Ejection Fraction)	EF	Ejection fraction
EF(Teich)	EF (Ejection Fraction)	EF	Ejection fraction
ESV(bp-el)	ESV	Volume	Volume (biplane)
ESV(Bullet)	ESV	Volume	Volume (bullet)
ESV(Cubed)	ESV	Volume	Volume (cubed)
ESV(MOD-bp)	ESV	Volume	Volume (biplane MOD)
ESV(mod-Simp)	ESV	Volume	Volume (mod-Simp)

ESV(MOD-sp2)	ESV	Volume	Volume (single-plane, 2-chamber MOD)
ESV(MOD-sp4)	ESV	Volume	Volume (single-plane, 4-chamber MOD)
ESV(sp-el)	ESV	Volume	Volume (single-plane ellipse)
ESV(Teich)	ESV	Volume	Volume (Teich)
FS	FS (Fractional Shortening)	FS	Fractional shortening
LVLd % diff	LVLd diff	%	% Difference of LV lengths
LVLs % diff	LVLs diff	%	% Difference of LV lengths
LVmass(AL)d	LVmass(AL)d	Mass	Left ventricular mass at end diastole
LVmass(AL)dI	LVmass(AL)dI	Mass index	Left ventricular mass at end diastole, indexed by body surface area
LVOT Area	LVOT Area	Area	Left ventricular outflow tract area
MM HR	MM HR	BPM	Heart rate
MR PISA	Proximal Isovelocity Surface Area (PISA)	Surface area	Mitral valve regurgitation proximal isovolumic surface area
MV Flow Area	MV Flow Area	Area	Mitral valve flow area
SV(bp-el)	Stroke Volume	Stroke volume	Stroke volume (2D)
SV(Bullet)	Stroke Volume	Stroke volume	Stroke volume (2D)

SV(Cubed)	Stroke Volume	Stroke volume	Stroke volume (2D)
SV(MOD-bp)	Stroke Volume	Stroke volume	Stroke volume (2D)
SV(mod-Simp)	Stroke Volume	Stroke volume	Stroke volume (2D)
SV(MOD-sp2)	Stroke Volume	Stroke volume	Stroke volume (2D)
SV(MOD-sp4)	Stroke Volume	Stroke volume	Stroke volume (2D)
SV(sp-el)	Stroke Volume	Stroke volume	Stroke volume (2D)
SV(Teich)	Stroke Volume	Stroke volume	Stroke volume (2D)

Doppler Calculations

Label	Formula	Type	Meaning
AI max PG	Maximum Pressure Gradient (Aortic Insufficiency)	Pressure gradient	Aortic insufficiency maximum pressure gradient (simplified)
Ao max PG	Maximum Pressure Gradient (Aortic Flow)	Pressure gradient	Aortic flow maximum pressure gradient (simplified bernoulli)
Ao max PG 2	Maximum Pressure Gradient (Aortic Flow)	Pressure gradient	Aortic flow maximum pressure gradient (full bernoulli)
Ao mean PG	Mean Pressure Gradient	Pressure gradient	Aortic flow mean pressure gradient (simplified bernoulli)
Ao mean PG 2	Mean Pressure Gradient	Pressure gradient	Aortic flow mean pressure gradient (full bernoulli)
Ao P1/2t	Pressure Half-Time	Pressure half-time	Aortic flow pressure half-time
Aortic HR	Aortic Heart Rate	BPM	Heart rate
AVA (I,D)	Area (I,D)	Area	Valve area (continuity formula) via velocity time integral
AVA (V,D)	Area (V,D)	Area	Valve area (continuity formula) via maximum velocity
CO(LVOT)	CO (Cardiac Output) (Doppler)	Cardiac output	Cardiac output via the left ventricular outflow tract

MR ERO	Proximal Isovelocity Surface Area (PISA)	Area	Mitral valve effective regurgitant orifice area
MR flow rate	Proximal Isovelocity Surface Area (PISA)	Flow rate	Mitral valve regurgitation flow rate
MR max PG	Maximum Pressure Gradient (Mitral Regurgitation)	Pressure gradient	Maximum pressure gradient (mitral regurgitation)
MR mean PG	Mean Pressure Gradient	Pressure gradient	Mean pressure gradient (mitral regurgitation) (simplified)
MR RF	Proximal Isovelocity Surface Area (PISA)	Fraction	Mitral valve regurgitant fraction
MR volume	Proximal Isovelocity Surface Area (PISA)	Regurgitant volume	Mitral valve regurgitant volume
MV E/A	MV E/A	Ratio	Mitral valve E-to-A ratio
MV max PG	Maximum Pressure Gradient (Mitral Valve)	Pressure gradient	Mitral valve maximum pressure gradient (simplified)
MV mean PG	Mean Pressure Gradient	Pressure gradient	Mitral valve mean pressure gradient (simplified)
MV P1/2t	MV P1/2T	Pressure half-time	Mitral valve pressure half-time
MVA (P1/2t)	MVA (P1/2T)	Area	Mitral valve area via P1/2t
PA max PG	Maximum Pressure Gradient	Pressure gradient	Maximum pressure gradient (simplified)

PA P1/2t	Pressure Half-Time	Pressure half-time	Pulmonary insufficiency pressure half-time
PI max PG	Maximum Pressure Gradient (Pulmonary Insufficiency)	Pressure gradient	Pulmonary insufficiency maximum pressure gradient (simplified)
Qp:Qs	Qp to Qs Ratio	Flow ratio	Ratio of pulmonic flow to systemic flow via simplified Doppler echocardiographic method
RVSP(TR)	RV Sys Press	Pressure	Right ventricular systolic pressure via TR
SV(LVOT)	Stroke Volume (Doppler)	Stroke volume	Left ventricular outflow tract stroke volume (Doppler)
SV(MV)	Stroke Volume (Doppler)	Stroke volume	Mitral valve stroke volume (Doppler)

MMode Calculations

Label	Formula	Type	Meaning
Aortic HR	Aortic HR	Cardiac output	Cardiac output (MMode)
CO(bp-el)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(Bullet)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(Cubed)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(MOD-bp)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(mod-Simp)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(MOD-sp2)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(MOD-sp4)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(sp-el)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
CO(Teich)	CO (Cardiac Output) (MMode)	Cardiac output	Cardiac output (MMode)
EDV(bp-el)	EDV	Cardiac output	Cardiac output (MMode)
EDV(Cubed)	EDV	Volume	Volume (cubed)
EDV(Teich)	EDV	Volume	Volume (Teich)
EF(bp-el)	EF (Ejection Fraction)	EF	Ejection fraction
EF(Cubed)	EF (Ejection Fraction)	EF	Ejection fraction

EF(Teich)	EF (Ejection Fraction)	EF	Ejection fraction
ESV(bp-el)	ESV	Volume	Volume (bp-el)
ESV(Cubed)	ESV	Volume	Volume (cubed)
ESV(Teich)	ESV	Volume	Volume (Teich)
FS	FS (Fractional Shortening)	FS	Fractional shortening
LA/AO	LA to AO Ratio	Ratio	LA dimension to aortic root ratio
LVmass(C)d	LVmass(C)d	Mass	Left ventricular mass via the cubic formula at end diastole
LVmass(C)dI	LVmass(C)dI	Mass index	Left ventricular mass via the cubic formula at end diastole, indexed by body surface area
MM HR	MM HR	BPM	Heart rate
RVSP(TR)	RV Sys Press	Pressure	Right ventricular systolic pressure via TR
SV(bp-el)	Stroke Volume (2D)	Stroke volume	Stroke volume (2D)
SV(Cubed)	Stroke Volume (2D)	Stroke volume	Stroke volume (2D)
SV(Teich)	Stroke Volume (2D)	Stroke volume	Stroke volume (2D)

Vascular Calculations

All vascular calculations are listed in the following tables, which appear in alphabetical order. See Appendix A for the formula, inherent approximations and assumptions, and clinical references for each calculation.

% Stenosis Calculations

Label	Formula	Type	Meaning
%Area Sten	% Area Stenosis	%	Percent area stenosis
%Diam Sten	% Diameter Stenosis	%	Percent diameter stenosis

A/B Velocity Ratio Calculation

Label	Formula	Type	Meaning
A/B Ratio	A-to-B Ratio	Ratio	Generic A/B velocity ratio

Carotid Calculations

Label	Formula	Type	Meaning
ICA/CCA Diastolic	ICA to CCA Ratio	Diastolic ratio	Internal carotid artery diastolic velocity to common carotid artery diastolic velocity ratio
ICA/CCA Systolic	ICA to CCA Ratio	Systolic ratio	Internal carotid artery systolic velocity to common carotid artery systolic velocity ratio

Flow Volume Calculation

Label	Formula	Type	Meaning
Flow vol	Flow Volume (Diameter)	Volume	Flow volume via diameter

Resistivity Index and Pulsatility Index Calculations

Label	Formula	Type
CCA RI	RI	Resistivity index
CCA PI	PI	Pulsatility index using time-averaged mean of the peaks
ECA RI	RI	Resistivity index
ECA PI	PI	Pulsatility index using time-averaged mean of the peaks
ICA RI	RI	Resistivity index
ICA PI	PI	Pulsatility index using time-averaged mean of the peaks
SCA RI	RI	Resistivity index
SCA PI	PI	Pulsatility index using time-averaged mean of the peaks
VA RI	RI	Resistivity index
VA PI	PI	Pulsatility index using time-averaged mean of the peaks

Volume Calculation

Label	Formula	Type	Meaning
Volume	Volume (Ellipsoid Three-Axis)	Volume	3-axis volume

OB/GYN Calculations

All OB/GYN calculations are listed in the following table. See Appendix A for the formula, inherent approximations and assumptions, and clinical references for each calculation.

Label	Formula	Type	Meaning
A/B	A-to-B Ratio	Ratio	Generic A/B velocity ratio
AC	Abdominal Circumference	Circumference	Abdominal circumference
AFI	Amniotic Fluid Index	AFI	Amniotic fluid index
CI(BPD,OFD)	CI (Cephalic Index)	CI	Cephalic index
Ductus Venosus PI	PI	Pulsatility index	Pulsatility index using time-averaged mean of the peaks
Ductus Venosus RI	RI	Resistivity index	Resistivity index
Ductus Venosus S/D	S-to-D Ratio	Ratio	Systolic-to-diastolic ratio
EFW(AC,BPD)Hadl	EFW(AC,BPD) via Hadlock	Weight	Estimated fetal weight via AC and BPD (Hadlock) Normal fetal weight percentiles
EFW(AC,BPD)Sh	EFW(AC,BPD) via Shephard	Weight	Estimated fetal weight via AC and BPD (Shephard) Normal fetal weight percentiles

EFW(AC,FL)Hadl	EFW(AC,FL) via Hadlock	Weight	Estimated fetal weight via AC and FL (Hadlock) Normal fetal weight percentiles
EFW(AC,HC,FL)Hadl	EFW(AC,HC,FL) via Hadlock	Weight	Estimated fetal weight via AC, HC, and FL (Hadlock) Normal fetal weight percentiles
EFW(B,H,A,F)Hadl	EFW(B,H,A,F) via Hadlock	Weight	Estimated fetal weight via BPD, HC, AC and FL (Hadlock) Normal fetal weight percentiles
EFW(BPD,AD,FL)Tokyo	EFW(BPD,AD,FL) via Tokyo	Weight	Estimated fetal weight via BPD, ADap, ADtrv, and FL (Tokyo)
EFW(BPD,FTA,FL)Osaka	EFW(BPD,FTA,FL) via Osaka	Weight	Estimated fetal weight via BPD, FTA, and FL (Osaka)
Fetal HR	Fetal Heart Rate	BPM	Fetal heart rate
FL/AC	FL-to-AC Ratio	Ratio	FL to AC ratio
FL/BPD	FL-to-BPD Ratio	Ratio	FL to BPD ratio
Flow vol	Flow Volume (Diameter)	Flow volume	Flow volume
GA(AC)Hadl	GA(AC) via Hadlock	Age	Gestational age via AC (Hadlock)
GA(BPD)Hadl	GA(BPD) via Hadlock	Age	Gestational age via BPD (Hadlock)

GA(BPD)Jeant	GA(BPD) via Jeanty	Age	Gestational age via BPD (Jeanty)
GA(BPD)Osaka	GA(BPD) via Osaka	Age	Gestational age via BPD (Osaka)
GA(BPD)Tokyo	GA(BPD) via Tokyo	Age	Gestational age via BPD (Tokyo)
GA(CRL)Jeant	GA(CRL) via Jeanty	Age	Gestational age via CRL (Jeanty)
GA(CRL)Osaka	GA(CRL) via Osaka	Age	Gestational age via CRL (Osaka)
GA(CRL)Remp	GA(CRL) via Rempen	Age	Gestational age via CRL (Rempen)
GA(CRL)Robin	GA(CRL) via Robinson	Age	Gestational age via CRL (Robinson)
GA(CRL)Tokyo	GA(CRL) via Tokyo	Age	Gestational age via CRL (Tokyo)
GA(FL)Hadl	GA(FL) via Hadlock	Age	Gestational age via FL (Hadlock)
GA(FL)Jeanty	GA(FL) via Jeanty	Age	Gestational age via FL (Jeanty)
GA(FL)Osaka	GA(FL) via Osaka	Age	Gestational age via FL (Osaka)
GA(FL)Tokyo	GA(FL) via Tokyo	Age	Gestational age via FL (Tokyo)
GA(FTA)Osaka	GA(FTA) via Osaka	Age	Gestational age via FTA (Osaka)
GA(GSD)Rempen	GA(GSD) via Rempen	Age	Gestational age via GSD (Rempen)
GA(GSD)Tokyo	GA(GSD) via Tokyo	Age	Gestational age via GSD (Tokyo)

GA(HC)Hadlock	GA(HC) via Hadlock	Age	Gestational age via HC (Hadlock)
GA(HL)Jeanty	GA(HL) via Jeanty	Age	Gestational age via HL (Jeanty)
GA(HL)Osaka	GA(HL) via Osaka	Age	Gestational age via HL (Osaka)
GA(MSD)Hellman	GA(MSD) via Hellman	Age	Gestational age via MSD (Hellman)
GA(SL)Toyko	GA(SL) via Tokyo	Age	Gestational age via SL (Tokyo)
GA(TC)Nimrod	GA(TC) via Nimrod	Age	Gestational age via TC (Nimrod)
GA(TL)Jeanty	GA(TL) via Jeanty	Age	Gestational age via TL (Jeanty)
GA(UL)Jeanty	GA(UL) via Jeanty	Age	Gestational age via UL (Jeanty)
HC	Head Circumference	Circumference	Head circumference computed
HC/AC	HC-to-AC Ratio	Ratio	Ratio of head circumference to abdominal circumference
L Follicle Vol (1-16)	Follicle Volume	Volume	1-distance volume of the 1st-16th follicle in the left ovary
L Ov PI	PI	Pulsatility index	Left ovarian pulsatility index
L Ov RI	RI	Resistivity index	Left ovarian resistivity index
L Ov S/D	S-to-D Ratio	Ratio	Left ovarian systolic-to-diastolic ratio

LOV	Ovarian Volume	Volume	Left ovarian volume
MSD	GA(MSD) via Hellman	Diameter	Mean sac diameter
PI	PI	Pulsatility index	Pulsatility index using time-averaged mean of the peaks
R Follicle Vol (1-16)	Follicle Volume	Volume	1-distance volume of the 1st-16th follicle in the right ovary
R Ov PI	PI	Pulsatility index	Right ovarian pulsatility index
R Ov RI	RI	Resistivity index	Right ovarian resistivity index
R Ov S/D	S-to-D Ratio	Ratio	Right ovarian systolic-to-diastolic ratio
RI	RI	Resistivity index	Resistivity index
ROV	Ovarian Volume	Volume	Right ovarian volume
S/D	S-to-D Ratio	Ratio	Systolic-to-diastolic ratio
TC	Thoracic Circumference	Circumference	Thoracic circumference computed
Umbilical PI	PI	Pulsatility index	Pulsatility index using time-averaged mean of the peaks
Umbilical RI	RI	Resistivity index	Resistivity index
Umbilical S/D	S-to-D Ratio	Ratio	Systolic-to-diastolic ratio

Uterine PI	PI	Pulsatility index	Pulsatility index using time-averaged mean of the peaks
Uterine RI	RI	Resistivity index	Resistivity index
Uterine S/D	S-to-D Ratio	Ratio	Systolic-to-diastolic ratio
UTV	Uterine Volume	Volume	Uterine volume
Volume	Volume (Ellipsoid Three-Axis)	Volume	3-axis volume

About Clinical References for Calculations and Formulas

References are provided for many of the calculations and formulas. Clinical calculations are usually based on studies of large patient populations. The formulas that are derived have some uncertainty or inaccuracy based on the correlation coefficient for the study involved. In many cases these uncertainties are greater than the inaccuracies of the ultrasound system measurement. Clinicians should always be familiar with the clinical reference provided for each calculation before using the system measurement and analysis data to make a clinical decision.

Patient Studies, Image Review, and Reports

About Patient Studies, Image Review, and Reports

A patient study includes demographic information, images, quantitative values, and a summary of findings. All patient studies for one patient are saved in a patient folder.

During an exam, all of the images you acquire are saved to the patient study, and a report is automatically generated. At any time, you can view all of the images in Image Review by pressing the **Review** key. You can view the report by pressing the **Report** key.

Using the Select Key in Image Review and Reports

In Image Review and reports, press the **Select** key at any time to view the options that are currently available to you. To choose an option, highlight the option with the trackball, and press the **Enter** key.

Patient Studies

About Patient Studies

A patient study includes demographic information, images, quantitative values, and a summary of findings. All patient studies for one patient are saved in a patient folder.

You can create a new patient study, edit information about a patient, or restart a patient study by pressing the **Patient** key.

Creating a Patient Study

Before you begin acquiring images, you must create a patient study or restart a patient study. If you do not, you cannot save the images you acquire. The way you create a patient study depends on whether or not you are using Modality Worklist.

To create a patient study if you are not using Modality Worklist:

1. Press the **Patient** key.

   The **Patient Identification** window appears.

2. Click **New**.

3. Enter the demographic information about the patient, pressing the **Tab** key to move from field to field.
4. Click **OK**.

Notes:

- If you enter a last name, but do not enter an MRN, an MRN is automatically generated based on the current time and date.
- Each time you change the preset, a new study is created for the patient, and the current study is closed.

Editing Patient Demographic Information

To edit demographic information about the current patient:

1. Press the **Patient** key.

   If you are using Modality Worklist, select a patient from the **Patient Selection** window.

   The **Patient Identification** window opens.
2. Click **Edit**.
3. Add or edit demographic information.
4. Click **OK**.

Note: The information shown in the **Patient Identification** window is determined by the current preset. To display information about the patient related to a different preset, select the preset from the **Additional Data Types** drop-down menu.

Saving a Patient Study

To save all of the changes you made to the current study including changes in the report work area, press the **Review** key to enter Image Review and click the following icon:

The study is saved on your system.

Note: To save a study to a disk, you must export the study by clicking the following icon:

Restarting a Patient Study

To continue or restart a patient study that is saved on your system:

1. Press the **Patient** key.
2. Click **Restart**.

   The **Search for Study** window opens.
3. Do one of the following:

- Type information you know about the patient, such as the MRN or last name, and click **Search**.
- To list all patient studies saved on your system, select **All Dates** from the **Study Date** drop-down menu, and click **Search**.

4. Click a column header to sort by **MRN**, **Name, Time**, **Type**, **Performed By**, or **Referring Physician**.
5. Use the trackball to move the icon over the patient study that you want to restart.
6. Press the **Enter** key.
7. Click **OK**.

   The **Patient Identification** window appears, populated with the selected patient's demographic information.
8. Click **OK**.

Searching for a Patient Study

To search for a patient study:

1. Press the **Review** key to enter Image Review.
2. Click .

   The **Search for Study** window opens.
3. Do one of the following:

- Type information you know about the patient, such as the MRN or last name, and click **Search**.
- To list all patient studies, select **All Dates** from the **Study Date** drop-down menu, and click **Search**.

4. Click a column header to sort by **MRN**, **Patient Name**, **Time**, **Type**, **Performed By**, or **Referring Physician.**
5. Use the trackball to move the icon over the patient study that you want to open, and do one of the following:

- Quickly press the **Enter** key twice.
- Press the **Enter** key, and click **Open Study**.
- Press the **Select** key, use the trackball to highlight **Open**, and press the **Enter** key.

Searching for a Patient Folder

A patient folder contains all of the patient studies for one patient.

To search for a patient folder:

1. Press the **Review** key to enter Image Review.
2. Click .

   The **Search for Patient Folder** window opens.
3. Do one of the following:

- To search, type the last name or MRN in the **Search for** field, and choose **Last Name** or **MRN** from the drop-down menu.
- To list all of the patient folders saved on your system, type * (an asterisk).

4. Click **Search Now**.
5. Click a column header to sort by **MRN** or **Patient Name**.
6. Move the trackball over the patient folder you want to open, and do one of the following:

- Press the **Enter** key and click **Open Folder**.
- Press the **Select** key, use the trackball to highlight **Open**, and press the **Enter** key.

The studies in the folder are listed.

7. Move the trackball over the study you want to open, and do one of the following:

- Press the **Enter** key and click **Open Study**.
- Press the **Select** key, highlight **Open Folder** with the trackball, and press the **Enter** key.

Moving a Patient Study

To move a patient study to another patient folder:

1. Press the **Review** key to enter Image Review.
2. Click .

   The **Search for Study** window opens. It lists all of the patient studies saved on your system.
3. Use the trackball to move the icon over the patient study you want to move.
4. Press the **Select** key.
5. Use the trackball to highlight **Move**.
6. Press the **Enter** key.
7. Choose the patient folder you want to the study into.
8. Click **OK**.
9. Click **Yes** to confirm that you want to move the study.

Deleting a Patient Study

To delete a patient study:

1. Press the **Review** key to enter Image Review.
2. Click .

   The **Search for Study** window opens.
3. Click **Search**.
4. Use the trackball to move the icon over the patient study that you want to delete.

   (Optional) Press and hold the **Control** key or the shift key to select more than one study.
5. Press the **Select** key.
6. Use the trackball to highlight **Delete**.
7. Press the **Enter** key.
8. Click **Yes** to confirm.
9. Click **Close**.

Viewing a Previous Study for the Current Patient

In Image Review, a tab appears for each patient study in the patient folder. The tab lists the time and date of the study. To view a previous patient study, click the tab.

Note: Previous studies are read-only. You cannot modify or add images or data to them.

Closing a Patient Study

To close a study and save all of the changes you made, press the **Review** key to enter Image Review, and click the following icon:

The study is saved on your system.

Before the study is closed, you are asked whether or not you want to save your changes.

Note:

- A study takes several seconds to close.
- When you create or open a patient study, the active study is closed before the new study is opened.

Image Review

About Image Review

At any point, you can press the **Review** key to review all of the images you acquired. In Image Review, you can view frames and loops, delete frames and loops from the patient study, edit loops, and close the study. You can also edit Stress Echo loops, specify the preferred Stress Echo loop, and relabel Stress Echo views in Image Review.

Entering Image Review

You enter Image Review when you take one of the following actions:

- You press the **Review** key.
- You press the **Acquire** key (if you clicked the **Switch to Thumbnails after acquire completes** check box in the **Acquisition** setup window).
- You acquire all of the loops for a view or a stage in a Stress Echo study.

Using the Select Key in Image Review

In Image Review, press the **Select** key at any time to view the options that are currently available to you. To choose an option, highlight the option with the trackball and press the **Enter** key.

About Thumbnails

In Image Review, you can view images in a grid format, called *Thumbnails*.

To return to Thumbnails when you are viewing a full-screen image, click .

Specifying the Image Display

You can choose how many images are automatically selected to be played back each time you select an image. Choose from the **Image Display** drop-down menu.

- Choose **Random** to display only the images you choose.
- Choose **2 up** to display two images simultaneously.
- Choose **4 up** to display four images simultaneously.
- Choose **6 up** to display six images simultaneously.
- Choose **9 up** to display nine images simultaneously.

If you choose **2 up**, when you select one image, that image and the following image are selected. If you click **Play**, those two images are played back simultaneously.

Specifying the Flag Display

You can choose to display only those images that have an image flag or a caption. Choose from the **Flag Display** drop-down menu.

- **All Images** displays all images.
- **Flagged Images** displays flagged images.
- **Captioned Images** displays images with a caption.
- **Flag Combination** displays only images with the image flags you specify.

Deleting an Image in Image Review

Throughout a study, you can mark images to be deleted. When you save the study, the images are deleted.

To mark or unmark one or more images for deletion:

1. In Image Review, click .
2. Use the trackball to move the cursor over the image.
3. Press the **Enter** key.
4. Press either **Del** key.

5. Repeat steps 2, 3, and 4 for other images you want to mark or unmark for deletion.

   The images are marked for deletion and are deleted when you save the study.

Caution: If mark an image for deletion that contains a measurement, the measurement is lost, even if you unmark the image for deletion later.

Calibrating an Image in Image Review

To manually calibrate an image:

1. In Thumbnails, move the cursor over the image with the trackball.
2. Press the **Enter** key
3. Click **Play**.
4. If you are viewing a loop, click to freeze the loop.
5. If necessary, use the **Frame Select** slide control to choose the frame you want to calibrate.
6. Use the trackball to move the cursor over the image.
7. Press the **Select** key.
8. Highlight **Calibrate Image** with the trackball.
9. Press the **Enter** key.
10. The **Manual Calibration** window opens.
11. Click the tab for the correct mode.
12. Follow the procedure described in the **Manual Calibration** window.
13. Click **OK**.

Adding a Caption or a Flag to an Image

You can add a caption or an image flag to an image. Image flags can be helpful when you want to indicate which images will be used, for example, for a teaching demonstration.

To add a caption or an image flag to an image:

1. In Image Review, use the trackball to move the cursor over the image.
2. Press the **Select** key.
3. Highlight **Caption/Flag** with the trackball.
4. Type the caption, or select an image flag from the list.
5. Click **OK**.

Viewing 3D or Panoramic Images in Image Review

Viewing a 3D or Panoramic Dataset

To view a 3D dataset or a panoramic dataset:

1. In Image Review, click .
2. Use the trackball to move the cursor over one of these icons on the bottom left corner of the image:

   — 3D dataset

   — Panoramic dataset
3. Press the **Enter** key.
4. 3D Mode or Panoramic Imaging opens and displays the image.
5. To close 3D Mode or Panoramic Imaging, press the **2D** key, the 3D Mode option key, or the Panoramic Imaging option key.

Note: The thumbnail of a 3D and panoramic image is not an accurate representation of the dataset.

Viewing a 3D Frame, a 3D Movie, or a Panoramic Frame

To view a 3D frame, a 3D movie, or a panoramic frame:

1. In Image Review, click .
2. Use the trackball to move the cursor over one of these icons on the bottom left corner of the image:

   — 3D frame or 3D movie

   — Panoramic frame
3. Quickly press the **Enter** key twice, or press the **Enter** key and click **Play**.

Printing Images in Image Review

To print an image:

1. Press the **Review** key to enter Image Review.
2. If you are viewing a loop, click freeze the loop.
3. If necessary, use the **Frame Select** slide control to choose the frame you want to print.
4. Press the **Record** key assigned to the printer you want to use.

Note: To print the Thumbnails view, click and press the **Record** key assigned to the printer you want to use.

Playing Back Loops in Image Review

About Playing Back Loops in Image Review

You have many options while viewing loops and frames in Image Review:

- View one full-screen frame
- Play back one full-screen loop
- Play back up to nine images at the same time
- Freeze the playback of a loop and select a frame within the loop
- Change the playback speed of a loop

- Synchronize the playback of multiple loops
- Compare images from different studies for the same patient
- Edit the end points of a loop

Viewing a Full-Screen Frame or Playing Back a Loop in Image Review

To view a full-screen frame or play back a loop when you are in Thumbnails, move the cursor over the image with the trackball, and do one of the following:

- Quickly press the **Enter** key twice.
- Press the **Enter** key, and click **Play**.

To view the previous loop or frame, click .

To view the next loop or frame, click .

Playing Back More Than One Image in Image Review

You can play back up to nine images at the same time in Image Review. The **Image Display** drop-down menu determines how you select the images that are played.

- If you select **Random** from the **Image Display** drop-down, you can select up to nine individual images to play back at once.
- If you select **2 up**, **4 up**, **6 up**, or **9 up** from the **Image Display** drop-down menu, when you click one image, a series of two, four, six, or nine sequential images is automatically selected.

To play back more than one image when **Random** is selected from the **Image Display** drop-down menu:

1. In Image Review, click .
2. Use the trackball to move the cursor over the first image.
3. Press the **Enter** key.
4. Repeat steps 2 and 3 for additional images.
5. Click **Play**.

To play back more than one image when **2 up**, **4 up**, **6 up**, or **9 up** is selected from the **Image Display** drop-down list:

1. In Image Review, click .
2. Use the trackball to move the cursor over the first image.
3. Press the **Enter** key.

   One or more consecutive images are automatically selected. For **2 up**, two images are selected, for **4 up**, four images are selected, and so on.
4. Click **Play**.

   To view the previous image, click .

   To view the next image, click .

Controlling the Playback of Loops in Image Review

While you are playing back a loop or loops in Image Review, you can control the loop playback.

Freezing and Playing a Loop

To freeze the playback of a loop, click .

To continue playing back the loop, click .

Changing the Playback Speed

To change the playback speed, use the **Loop Speed** slide control.

Note: The default playback speed is 100%.

Selecting a Frame in a Loop

To select a frame in a loop:

To freeze the playback, click .

To select the frame, use the **Frame Select** slide control.

Specifying the Synchronization Mode

When you are playing back more than one loop simultaneously, you can use the trackball to select from the **Synchronization Mode** drop-down menu:

- **Free run** – The loops play back continuously at the same speed.
- **Synch to both ends** – If the loops are different lengths, the speed is adjusted so that the loops all begin and end at the same time.
- **Synch to beginning** – All loops begin at the same time and play back at the same speed.

Comparing Images from Two Studies

To compare an image from the current study with an image from a previous study in the same patient folder:

1. In Image Review, click .
2. Move the cursor over the first image with the trackball.
3. Press the **Enter** key.
4. Click the tab for the previous study.
5. Use the trackball to move the cursor over the second image.
6. Press the **Enter** key.
7. Click **Play**.

Editing the Endpoints of a Loop

To edit the beginning or the end of a loop:

1. In Image Review, click .
2. Use the trackball to move the cursor over the image.
3. Quickly press the **Enter** key twice.
4. Use the trackball to move the cursor over the image.

5. Press the **Select** key.
6. Highlight **Loop Edit** with the trackball.
7. Press the **Enter** key.

   To adjust the endpoints, use the trackball to move the cursor over the endpoint, press and hold the **Enter** key, and move the trackball.

8. Click **OK**.

Reports

About Reports

A report is automatically generated about a patient while you conduct an exam. At any point during a study, you can view the automatically generated report by pressing the **Report** key. A report includes:

- Patient demographic information
- Measurement and calculation information
- Cardiac wall motion scoring information
- Images that you add to the report
- Obstetrical trending graphs

Note: The entire report is not visible on the screen at one time. You must use the scroll bars to the right of and below the report to view the entire report.

Report Work Area

When you press the **Report** key, the report appears on the left, and the report work area appears on the right. The report work area displays information about the study and allows you to make changes to patient information, measurements, finding codes, comments, and obstetrical graphs.

Measurements and Calculations in a Report

When you perform a labeled measurement or calculation, the information is automatically added to the report. Unlabeled measurement information is only added to the report if you acquire the image.

All instances of each measurement appear in the work area. In general, the five most recent instances of each measurement appear in the report. The others are enclosed in parentheses in the work area.

Viewing Reports for Different Presets

Reports contain information related to the current preset. For example, cardiac reports include cardiac information, and obstetrical reports contain obstetrical information.

If the information you need does not appear in the report, change the preset.

Finalizing a Report

When a report is finalized, you can no longer make changes to it. The next time you open the study, a new version of the report is created. A report is finalized when you do one of the following:

- Save the report
- Create a new patient study
- Restart a patient study
- Open a different patient study
- Click .

Displaying and Hiding the Report Work Area

The report work area appears to the right of the report.

To hide the report work area, click .

To display the report work area, click again.

Viewing Report Versions

When you close a study, you can no longer make changes to the report. Each time you open the study, a new version of the report is created.

To display all of the versions of the report, click the following icon:

A tab appears for each version of the every report for the current patient. The tabs are labeled with the time and date that the report versions were created and the version number. To view an earlier version, click the tab.

Printing a Report

To print a report, press the **Report** key and the **Record** key assigned to the printer you want to use.

Note: You cannot print a report to a networked DICOM printer.

Saving a Report as a Series of DICOM Images

If you want to be able to export a report in DICOM format, you can save the report as a series of DICOM images.

To do so, press the **Acquire** key while you are viewing the report. The report appears in Thumbnails as a series of DICOM images.

When you export the study, these images of the report are exported with all of the other images.

Adding an Image to a Report

You can only add a still frame to a report.

To add a frame to a report:

1. In Image Review, click .
2. Move the cursor over the image with the trackball.
3. Quickly press the **Enter** key twice.
4. If you are viewing a loop, click to freeze the loop.
5. If necessary, use the **Frame Select** slide control to choose the frame you want to add.

6. Do one of the following:

- Click .
- Press the **Select** key, highlight **Put Image in Report** with the trackball, and press the **Enter** key.

7. (Optional) Type the caption to accompany the image.
8. Click **OK**.

Adding Patient Information to a Report

You can add or change information about a patient in a report.

To add or change patient information in a report:

1. Press the **Report** key.
2. Click the **Information** tab.
3. Move the cursor over a field with the trackball.
4. Quickly press the **Enter** key twice.
5. Type the information.
6. (Optional) Click **Next** to proceed to the next field.
7. Click **OK**.

Adding Interpretations to a Cardiac Report

You can choose or manually type finding codes for various attributes of cardiac structures. An interpretation summary determined by the fining code appears in the report.

To add an interpretation to the report, do one of the following:

1. Press the **Report** key.
2. Click the **Interpret** tab.
3. Click the button for the structure the interpretation relates to.
4. Use the trackball to move the cursor over a field.
5. Press the **Select** key.

6. Use the trackball to highlight the finding code, or highlight **Manual Text Entry** if you want to manually type an interpretation.
7. Press the **Enter** key.

   The interpretation appears in the report.

Or

1. Press the **Report** key.
2. Click the **Interpret** tab.
3. Click the button for the structure the interpretation relates to.
4. Type the finding code in the **Finding Code** field and skip to step 7, or type the first letter of the finding code.
5. Press the **Return** key.
6. Scroll to the appropriate finding code.
7. Press the **Enter** key.

   The interpretation appears in the report.

Adding Visualizations and Observations to an Obstetric Report

When you are in an obstetric preset, you can choose or manually type obstetric visualizations and observations, which appear in the report.

You can also type biophysical profile values that are used to calculate the biophysical profile total.

Note: Biophysical profiles do not appear in the report if they have no value.

To add a visualization, an observation, or biophysical profile information to an obstetric report:

1. Press the **Report** key.
2. Click the **Interpret** tab.
3. Use the trackball to move the cursor over the **Visualizations** or **Observations** field.
4. Press the **Select** key.

5. Use the trackball to highlight the visualization or observation, or highlight **Manual Text Entry** to type a value.
6. Press the **Enter** key.

   The visualization or observation appears in the report.
7. To enter biophysical profile values, clear the appropriate **N/A** check box, click the **Movement**, **Tone**, **Breathing**, or **AF Volume** field, and type the value.

   The biophysical profile value appear on the **Interpret** tab and in the report.

Adding Visualizations and Observations to a Gynecologic Report

When you are in a gynecologic preset, you can choose or manually type gynecologic visualizations and observations, which appear in the report.

To make observations about follicles, click the **Left Follicle** or the **Right Follicle** tab. Select the appropriate check boxes (**Crenation** or **Cumulus**) for each follicle. To hide follicle observation information from the report, clear the **Show on report** check box.

To add a visualization or an observation to a gynecologic report, do one of the following:

1. Press the **Report** key.
2. Click the **Interpret** tab.
3. Use the trackball to move the cursor over the **Visualizations** or **Observations** field.
4. Press the **Select** key.
5. Use the trackball to highlight the visualization or observation, or highlight **Manual Text Entry** to type a value.
6. Press the **Enter** key.

   The visualization or observation appears in the report.

Or

1. Press the **Report** key.
2. Click the **Interpret** tab.

3. Type the finding code in the **Finding Code** field and skip to step 6, or type the first letter of the finding code.
4. Press the **Return** key.
5. Scroll to the appropriate finding code.
6. Press the **Enter** key.

   The interpretation appears in the report.

Adding Comments to a Report

You can use the **Comments** tab in the report work area to add comments and summary statements to a report. On the **Comments** tab, you can also view the list of images in the report and delete images from the report.

To add comments to a report:

1. Press the **Report** key.
2. Click the **Comments** tab.
3. To make a comment, use the trackball to move the cursor into the **Comments** area, press the **Enter** key, and type the comment.
4. To add a summary statement, use the trackball to move the cursor into the **Summary** area. Press the **Select** key, highlight the summary statement with the trackball, and press the **Enter** key.
5. To delete an image from the report, select the name of the image from the **Report Images** field with the trackball and the **Enter** key, and press the **Del** key.

Generating Obstetric Trending Graphs

When you are in an obstetrics preset, you can generate trending graphs for the current study and studies saved on a floppy disk. Those trending graphs appear in the report.

To generate a trending graph:

1. Press the **Report** key.
2. Click the **Trending** tab.
3. (Optional) Choose a new value from the **Fetal Weight** drop-down menu.
4. (Optional) Change the x-coordinate for the graph by clicking **AUA** or **LMP**.

5. Select the biometrics you want to use for the trending graphs by selecting the appropriate tabs (**Basic**, **Cranium**, or **Long Bones**) and check boxes.
6. If necessary, insert a floppy disk that contains the trending data from the previous study or studies.
7. Click **Import Data**.

   Trending files from studies with the same MRN are imported from the floppy disk.
8. Select the check boxes for the studies you want to use in the trending graphs.
9. Click **Update report**.

   The trending graphs appear in the report.
10. To modify the trending graphs in the report, change the trending settings, and click **Update report**.

Note: To export obstetric trending data from the current study to a floppy disk, click **Export data**.

Measurements in Image Review and Reports

About Measurements in Image Review and Reports

In Image Review, you can perform measurements and calculations on images from the current study and on images from studies saved on your system. You cannot perform measurements on images that you import from a disk.

You can edit measurements on images from studies that you saved on your system, but not on images from studies that you imported.

You can manipulate the measurements and calculations in the report work area.

Note: The measurements and calculations that appear in Image Review depend on the preset and on the settings on the **Analysis Setup** tab.

Performing a Labeled Measurement or a Calculation in Image Review

To perform a labeled measurement or calculation on an image in Image Review:

1. In Image Review, click
2. Use the trackball to move the cursor over the image.
3. Press the **Enter** key twice.
4. If you are viewing a loop, click the icon to freeze the loop.
5. If necessary, use the **Frame Select** slide control to choose a frame.
6. Press the **Menu** key above the **Measure** key.
7. Select the imaging mode from the **Measurement Mode** drop-down menu.
8. Click the **Measurements** or **Calculations** option button.
9. Select the type of measurement or calculation.
10. If you need to specify the fetus or the side of the anatomy being measured, press the **Report** key, click the **Measure** tab, and specify the fetus or side. Press the **Review** key to return to the measurement.
11. Do one of the following:

- Click the **Measure** button.
- Click the **Keyboard** button to manually enter a measurement.

12. Position the caliper with the trackball.
13. Press the **Enter** key to anchor each caliper and display the next caliper.
14. To approve the measurement, press the **Enter** key.
15. To see the results box, close or move the **Perform Measurements** window.

Performing an Unlabeled Measurement in Image Review

To perform an unlabeled measurement on an image in Image Review:

1. In Image Review, click
2. Use the trackball to move the cursor over the image.
3. Press the **Enter** key twice.

4. If you are viewing a loop, click the icon to freeze the loop.
5. If necessary, use the **Frame Select** slide control to choose a frame.
6. Press the **Measure** key.
7. Use the trackball to highlight the type of measurement, and press the **Enter** key.
8. Position the caliper with the trackball.
9. Press the **Enter** key to anchor each caliper and display the next caliper.
10. To approve the measurement, do one of the following:

- For a linear measurement, press the **Enter** key.
- For a trace or volume measurement, press the **Enter** key twice.

Editing Measurements in Image Review

You can edit measurements or calculations on images from studies that you saved on your system, but not on images from studies that you imported.

Note: You cannot delete a measurement in Image Review after you approve it. You can, however, delete a measurement in the report work area.

To edit a measurement in Image Review:

1. Use the trackball to move the cursor over the endpoint.
2. Press and hold the **Enter** key.

   The measurement turns blue.
3. Move the endpoint with the trackball.
4. To anchor the endpoint, release the **Enter** key.

Manipulating Measurements in a Report

You can view the image associated with measurements that appear in a report; edit, delete, and label measurements; and use the measurements in calculations.

To manipulate measurements that appear in a report:

1. Press the **Report** key.
2. Click the **Measure** tab.
3. Use the trackball and the **Enter** key to highlight the measurement you want to manipulate.
4. Press the **Select** key.
5. Use the trackball and the **Enter** key to highlight one of the following options:

- **Delete** – Displays the associated image (if the image was acquired). You must confirm that you want to delete the measurement.
- **Edit** – Allows you to type a measurement value.
- **Label** – Allows you to choose a label for an unlabeled measurement.
- **Perform** – Displays the image so you can perform the measurement.
- **Relabel** – Allows you to relabel a measurement.
- **Show Image** – Displays the image associated with the selected measurement.
- **Use in Calcs** – Allows you to use the measurement in a calculation.

6. Press the **Enter** key.

Notes:

- You can also delete a measurement from the report area by using the trackball to highlight the measurement and pressing the **Del** key above the **Measure** key.
- You can display an image associated with a measurement only if you acquired the image or if the measurement is still on the image in live imaging.

Importing and Exporting

About Importing and Exporting

Importing and Exporting in DICOM Format

DICOM format is used for patient studies that are transferred among computers that make up an information management system and for studies that are accessed by physicians at remote viewing stations.

You can export a patient study in DICOM format to an optical disk, to a CD-R, or over a network.

You can import one or more studies that were created on an EnVisor system and saved in DICOM format from an optical disk or a CD-R.

Notes:

- If you have the DICOM Media option, you can export studies in DICOM format. Those studies can be viewed on any DICOM viewer. If you do not have the DICOM Media option, exported studies can only be viewed on EnVisor A.1 systems.
- Exporting a study over a network is a component of the DICOM Basic option.
- The DICOM Media option includes an optical disk drive. Any data that can be exported to a CD-R can also be exported to an optical disk. A CD-R can only be used once; whereas the files on an optical disk can be deleted so the optical disk can be used again.

Exporting in PC Format

You can export images and reports in PC format:

- Frames are saved as .bmp files.
- Loops are saved as .avi files.
- Reports are saved as HTML files.

You can export a frame or a report to a floppy disk, a CD-R, or an optical disk. You can export images to a CD-R or an optical disk.

Notes:

- You cannot import files saved in PC format (.bmp, .avi, or HTML files).
- You can export the report and all of the images in a study in PC format, but you cannot export a study in PC format.

Importing and Exporting Obstetric Trending Data

You can import trending data from and export trending data to a floppy disk.

Note: Files in PC format (.bmp, .avi. and HTML files) are typically used to make copies of images for training sessions and presentations.

Caution: If you want to change DICOM settings not covered in this book, see your network administrator. Do not make any changes to network settings without consulting with your network administrator.

Importing a Patient Study in DICOM Format

You can import from an optical disk or a CD-R one or more patient studies that were created on an EnVisor system and saved in DICOM format.

When you import a study, a new patient study is created. If a patient folder for the MRN already exists, the new study is placed in the existing folder. If a folder does not exist for that MRN, a new folder is automatically created.

Notes:

Importing a study does not open the study.

- If you have the DICOM Media option, you can export studies in DICOM format. Those studies can be viewed on any DICOM viewer. If you do not have the DICOM Media option, exported studies can only be viewed on EnVisor A.1 systems.
- Importing a study from an optical disk or a CD-R is a component of the DICOM Media option.

To import one or more patient studies:

1. In Image Review, click
2. Use the trackball and the **Enter** key to highlight the study you want to import.
3. (Optional) Press and hold the **Control** key or the shift key to select more than one study.
4. Click **Import all** or **Import selected**.
5. Use the trackball to specify the patient folder for the imported data.
6. Click **OK**.

Exporting the Current Patient Study in DICOM Format

If you have the DICOM Media option, you can export a study to an optical disk or a CD-R. If you have the DICOM Basic option, you can export a study across a network to a DICOM PACS system. When you export a study in DICOM format, the images and information are saved as DICOM files.

Notes:

- If you have the DICOM Media option, studies exported to an optical disk or a CD-R can be viewed on any DICOM viewer. If you do not have the DICOM Media option, exported studies can only be viewed on EnVisor A.1 systems.
- When you export a still image, any measurements remain on the image. When you export a loop, all measurements are removed before the loop is exported. When you import the study, you cannot reactive measurements or perform new measurements.

To export the current study in DICOM format:When you export a study, some patient demographic information may not be exported.

1. In Image Review, click
2. If necessary, close the study and save your changes when you are prompted.
3. Choose the destination for the study.

   Note: In the **Destination** drop-down menu, disk drives are identified with a drive letter and drive name. Networked DICOM servers and printers are identified as **DICOM PACS** or **DICOM printer**.
4. Click **Start export**.

Exporting Patient Studies

You can export any patient study using the **Search for Study** window. If you have the DICOM Media option, studies exported to an optical disk or a CD-R can be viewed on any DICOM viewer. If you do not have the DICOM Media option, exported studies can only be viewed on EnVisor A.1 systems.

If you have the DICOM Basic option, you can export a study across a network to a DICOM PACS system.

The following icons that appear next to the studies in the **Search for Study** window indicate the export status of the study:

The study has been exported at least once to an optical disk, to a CD-R, or over a network.

The study is queued to be exported over a network. When the system receives confirmation that the study was exported successfully, the icon changes to .

An attempt to export the study was made, but the export failed.

The study is currently open. You cannot export a study that is currently open.

At least one image as been added to the study since the last time the study was viewed.

Notes:

- When you export a still image, any measurements remain on the image. When you export a loop, all measurements are removed before the loop is exported. When you import the study, you cannot reactive measurements or perform new measurements.
- When you export a study, some patient demographic information may not be exported.

To export one or more studies:

1. In Image Review, click

   The **Search for Study** window opens.
2. Click **Search**.
3. Use the trackball to move the cursor over the patient study you want to export.

   (Optional) Press and hold the **Control** key or the shift key to select more than one study.

4. Press the **Select** key.
5. Use the trackball to highlight **Export** or **Export DICOM**.
6. Press the **Enter** key.
7. Choose the destination for the study.

   Note: In the **Destination** drop-down menu, disk drives are identified with a drive letter and drive name. Networked DICOM servers and printers are identified as **DICOM PACS** or **DICOM printer**.
8. If you have DICOM Media and you are not exporting to a DICOM server, select the image format and compression.
9. Click **Start export**.

Exporting an Image in PC Format

You can export an individual frame or loop to a floppy disk, an optical disk, or a CD-R. Frames are saved in .bmp format. Loops are saved in .avi format.

Note: When you export a still image, any measurements remain on the image. However, when you export a loop, all measurements are removed before the loop is exported.

To export a frame or a loop:

1. In Image Review, click
2. Use the trackball to move the cursor over the image.
3. Quickly press the **Enter** key twice.

   A full-screen image appears.
4. If you are viewing a loop, click to freeze the playback of the loop.
5. If necessary, use the **Frame Select** slide control to choose the frame you want to export.
6. Do one of the following:

- Press the **Select** key, highlight **Export Image** with the trackball, and press the **Enter** key.
- Click

7. For a loop, specify whether you want to export the current frame or the whole loop.
8. Change any necessary settings.
9. Click **Export**.
10. Choose the destination.
11. Type the file name for the image.
12. Click **Save**.

Exporting Images in PC Format

You can export all of the images displayed in Thumbnails or just selected images to an optical disk or a CD-R. The frames are saved in .bmp format. The loops are saved in .avi format.

When you export images, you can specify whether you want to export the latest version of the report with the images.

Note: When you export a still image, any measurements remain on the image. However, when you export a loop, all measurements are removed before the loop is exported.

To export images in PC format:

1. In Image Review, click
2. (Optional) Use the trackball and the **Enter** key to select one or more images.
3. Click
4. Specify whether you want to export all of the images or only the selected images.
5. Specify whether you want to export the report.

6. Specify the .avi image quality.
7. Click **Export**.
8. Choose the destination.
9. Type a base file name for the images.
10. Click **Save**.

Exporting a Report in PC Format

You can export a report to a floppy disk, an optical disk, or a CD-R. Reports are saved as HTML files.

When you export a report, you can specify whether you want to export all of the images displayed in Thumbnails with the report.

Note: You cannot export a report over a network or to a DICOM printer.

To export a report:

1. Press the **Report** key.
2. Click
3. Specify whether you want to export all of the images.

   Note: The following steps apply only if you export the report without the images. If you export the report with the images, the **Export Images in PC Format** window opens.
4. Choose the destination.
5. Type a file name for the report.
6. Click **Save**.

Exporting Data to a Third-Party Application

You can export data and patient demographic information to a third-party software application if you are in an obstetric, GYN, or Fetal Heart preset.

Before you export data to a third-party application, you must

- Plug a serial cable into your system to connect your system to the computer that houses the third-party software application.
- Assign a **Record** key to serial output.

To export the data from the current study to a third-party application, press the **Record** key you assigned to serial output while you are viewing the report.

Note: For information about the format of the exported data, see the *EnVisor Series Safety and Standards Guide* in the *EnVisor Series Reference Guide*.

9

Stress Echocardiography

About Stress Echocardiography

Stress Echocardiography (Stress Echo) is a protocol-driven exam that allows a cardiologist to assess cardiac wall motion at various heart rates by acquiring views of the heart at different stages of the exam.

A Stress Echo study consists of two to eight stages during which loops are acquired for up to eight anatomical views. Each loop is a sequence of frames captured at systole starting at the R-wave.

Before You Perform Your First Stress Echo Study

Before you perform the first Stress Echo study, Stress Echo must be installed on your system. Also, you need to assign one of the option keys to Stress Echo.

Gain Save

During the first stage of a Stress Echo protocol, you can adjust the system settings, the ROI setting, and imaging controls, such as the **Depth** key, the 2D **Gain** rotary control, the **TGC** slide controls. Because of a feature called *gain save*, the settings for each view are saved and then are restored when you acquire the same view in the other stages.

Note: If you stop and resume a stress echo study, gain save no longer applies.

ECG in Stress Echo

In Stress Echo, the acquisition of loops is triggered by the R-wave. Therefore, in order to perform a Stress Echo study, an ECG trace with R-waves must appear on the imaging screen. If no R-wave is detected, the icon below is displayed on the imaging screen, and a one-second Stress Echo loop is acquired.

The ECG is captured and displayed with loops that you acquire in Stress Echo.

Notes:

- Stress Echo is an option .

- The foot switch option is included in the Stress Echo option.
- When you export a Stress Echo study, only the preferred loops are exported.

Stress Echo Setup

About Stress Echo Setup

Before you begin a Stress Echo study, you may create Stress Echo presets based on default Stress Echo protocols. During a Stress Echo study, you may modify the Stress Echo preset you are using by adding views or stages.

Creating a Stress Echo Preset

To create a Stress Echo preset:

Select a cardiac preset as a starting point for your Stress Echo preset.

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Stress** tab.

   The **Stress** window opens.

3. Make changes that you want for your preset:

   Load Defaults – Choose one of three default protocols or create your own.

   – **Default Acquisition Type** – Specify whether the stages are single-cycle or quad-cycle acquisition stages.

   – **Stage Name** – Add stages or edit stage names.

– **Start View** – Select a new starting view for any stage.

Note: The view order appears below the **Load Defaults** button.

Multi – Specify the multi-cycle stage.

VCR – Specify which stages are VCR stages.

Timer – Specify the timer stage.

Edit Views – Add views or edit view names.

Clear All – Delete all of the settings.

R-Wave Delay – Specify the time lapse between the R-wave and the acquisition of the first frame. A positive number results in acquisition after the R-wave; a negative number results in acquisition before the R-wave.

4. Click **Apply**.
5. Click **Close**.
6. Press the **Preset** key.
7. Press the **Save Preset** soft key.
8. Click **Create New**.
9. Type the name of the preset you want to create.
10. Click **Save**.

About ECG Artifacts

Although artifacts can occur during traditional echocardiography exams while patients are lying at rest, exercise-induced Stress Echocardiography exams are more likely to produce ECG artifacts due to increased muscle movement and respiration rates.

The type of Stress Echocardiography exam you perform influences the probability of ECG artifact occurrences, as described below:

Examination Type	Respiration Artifacts	Muscle Motion Artifacts	Recommended Type of ECG
Traditional Echocardiography	No	No	3-lead
Stress Echo (Pharmacological)	Yes	No	12-lead
Stress Echo (Exercise)	Yes	Yes	12-lead

The presence of ECG artifacts can cause the following problems:

- The heart rate display may be inaccurate if an artifact is detected as a heart beat.
- A premature trigger for image acquisition may occur due to an ECG artifact.

Philips highly recommends that you videotape Stress Echo studies to avoid losing image data due to ECG artifacts.

Minimizing ECG Artifacts

The following options may reduce the incidence of ECG artifacts and triggering problems during Stress Echo studies:

- The best way to monitor ECG artifacts is to activate the audible R-wave beep. This audio signal helps you distinguish between true arrhythmias and premature triggering caused by ECG artifacts.
- To minimize motion and respiration artifacts, use a 12-lead cardiograph. Adjust the ECG Gain so that the QRS pulses are detected and an accurate heart rate appears on the ultrasound system.
- Some 12-lead cardiographs provide a square-wave pulse output signal that can be input into the ultrasound system's ECG auxiliary channel on the physio panel. This output signal helps minimize ECG artifacts. If a square-wave pulse from another machine is used, you may have to increase the ECG Gain.

Modifying a Stress Echo Preset

You can modify the current Stress Echo preset at any time.

To modify the current Stress Echo preset:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Stress** tab.

   The **Stress** window opens.

3. Make changes to the preset:

- You can define additional views or delete views for a protocol before you acquire the first loop of a study.
- You can create additional stages anytime.
- You can delete a stage if you have not yet acquired a loop for that stage.

4. Click **Apply**.
5. Click **Close**.

About Stress Echo Protocols

You can use one of the three Philips Stress Echo protocols to perform a Stress Echo study, or you can base your own preset on one of the protocols.

Protocol Name	Stages	Timer	VCR	First View	Acquisition Type
Exercise 2-Stage	Rest	Off	Off	LAX	Quad-cycle
	ImPost	On	On	AP4	Multi-cycle
Exercise 3-Stage	Rest	Off	Off	LAX	Quad-cycle
	Peak	On	On	AP4	Multi-cycle
	Post	Off	Off	LAX	Quad-cycle

Pharmacological 4-Stage	Base	Off	Off	LAX	Quad-cycle
	Low	Off	Off	LAX	Quad-cycle
	Peak	On	On	LAX	Quad-cycle
	Post	Off	Off	LAX	Quad-cycle

About Stress Echo Acquisition Methods

For each Stress Echo stage, you can choose from three acquisition methods:

- **Single-cycle** – When you press the **Acquire** key, one loop is acquired and saved to the study.
- **Quad-cycle** – When you press the **Acquire** key, four consecutive loops (one per heart cycle) are acquired and saved to the study.
- **Multi-cycle** – When you press the **Acquire** key, up to 200 loops (one per heart cycle) are continuously acquired and saved to the study, allowing you to continuously acquire loops for all views in a particular stage. Press the **Enter** key to proceed from one view to the next. After you have imaged all of the views, press the **Acquire** key to end the acquisition. Press the **End Acquire** soft key when you are finished with the multi-cycle acquisition to enter Image Review.

  Note: Only one multi-cycle stage is allowed in each protocol.

Using a VCR During a Stress Echo Study

The VCR begins recording when you do one of the following:

- You press the **Record** key that is assigned to the VCR.
- You press the **Acquire** key to acquire the first view of a VCR stage.

The VCR stops recording when one of the following occurs:

- One loop has been acquired for a single-cycle VCR stage.
- Four loops have been acquired for a quad-cycle VCR stage.
- You press the **End Acquire** soft key during a multi-cycle VCR stage.

- Two hundred loops have been acquired for a multi-cycle VCR stage.
- You press the VCR **Stop** soft key.
- You press the **Record** key assigned to the VCR to pause recording.

Using the Timer During a Stress Echo Study

The timer indicates the time that has elapsed since the timer started. The timer starts under the following circumstances:

- The timer automatically starts when you begin acquiring loops in a stage that you defined as a timer stage.
- You may start the timer at any point by pressing the **Timer** soft key. If the timer is already running, pressing the **Timer** soft key hides the timer. Elapsed time is maintained while the timer is hidden.

The timer stops automatically at the end of the stage. You cannot manually turn the timer off.

Note: If an ImPost stage is defined to be a timer stage, be sure to account for the time lapse between the moment exercise ends and acquisition begins.

Stress Echo Acquisition

About Stress Echo Acquisition

A Stress Echo protocol leads you through the acquisition and acceptance of loops for each view for each stage of the protocol. The number of loops acquired for each stage depends on the acquisition method you choose for the stage.

To display the Stress Echo soft keys at any time, press the Stress Echo option key.

Performing a Stress Echo Study

The following overview describes how to perform a Stress Echo study. Click a step for more information.

To perform a Stress Echo study:

1. Connect the ECG cable and attach the ECG leads.
2. Assign an option key to Stress Echo if you have not done so already.

3. Create a Stress Echo preset, or select a Stress Echo preset that you created previously.
4. Create a new patient study.
5. Press the Stress Echo option key.

   A view icon and a stage-view label appear on the imaging screen.
6. Acquire loops for single-cycle and quad-cycle acquisition stages.
7. Select the preferred loop for each view in Image Review.
8. Acquire loops for the multi-cycle acquisition stage (if the protocol includes one).
9. Select the preferred loop for each view in Image Review.

Note: In order to perform a Stress Echo study, an ECG trace must appear on the imaging screen. If no R-wave is detected, the icon below is displayed on the imaging screen, and a one-second Stress Echo loop is acquired.

Using Stress Echo Soft Keys

To display the Stress Echo soft keys at any time, press the Stress Echo option key.

To change any of the settings listed below, press the oval key below the soft key label.

End Acquire: Use the **End Acquire** soft key to end the acquisition of the loop for the current stage. The **End Acquire** soft key is available only during a multi-cycle acquisition stage when acquisition is paused.

Hide ROI: Use the **Hide ROI** soft key to remove the region of interest (ROI) box from the image.

Show ROI: Use the **Show ROI** soft key to display the ROI box on the image.

Pause Protocol: Use the **Pause Protocol** soft key to temporarily leave the Stress Echo protocol so that you can acquire additional loops or frames outside of the Stress Echo protocol.

Unpause Protocol: Use the **Unpause Protocol** soft key to resume a paused protocol.

Stage: Use the **Stage** soft key to advance to the next stage while you are acquiring loops. The **Stage** soft key is available only after you have acquired at least one loop per

view in the current stage. The **Stage** soft key is not available if you have acquired any loops in the next stage.

Timer: Use the **Timer** soft key to start the timer if it is off. If the timer is running, pressing the **Timer** soft key hides the timer. Elapsed time is maintained while the timer is hidden.

View: Use the **View** soft key to specify which view you want to acquire next.

About the View Icon and the Stage-View Label

When you are acquiring loops in a Stress Echo study, a view icon and a stage-view indicator appear on the imaging screen to help you monitor loop acquisition.

View Icon

A rectangle appears on the upper right corner of the imaging screen that indicates how many views have been acquired for the current stage. The rectangle contains four or eight squares, one for each possible view.

- **Blank square** – The view has not yet been acquired, or the loop has been deleted.
- **Check mark** – The view has been acquired.
- **X** – No view needs to be acquired. For instance, if a stage has five views, three of the eight squares will contain an **X**.

Stage-View Label

The stage-view label lists the name of the current stage and view.

Acquiring Loops for a Single-Cycle or a Quad-Cycle Acquisition Stage

To acquire loops for a single-cycle or a quad-cycle acquisition stage:

1. Press the **Acquire** key to begin acquiring loops for the first view of the first stage.

- For a single-cycle acquisition stage, one loop is acquired and is displayed for your review in Image Review.
- For a quad-cycle acquisition stage, four loops (one per heart cycle) are acquired and are displayed for your review in Image Review.

2. The first loop you acquire for each view is by default the preferred loop. To change the preferred loop, select the check box in the bottom left corner of the loop.
3. Press the **Review** key or the **2D** key to accept the loop or the loops and proceed to the next view.

   Press the **Acquire** key to reject the loop or loops and reacquire the view.
4. After you acquire all of the views for a stage, do one of the following:

- Press the **Review** key or the **2D** key to accept the loop or loops and proceed to the next stage.
- Press the **Acquire** key to reject the loop or loops and reacquire any views.

To add a stage or view, press the **Setup** key.

Note: Although you automatically advance to the next view or stage, you can specify which view or stage you want to acquire with the **View** soft key or the **Stage** soft key.

Acquiring Loops for a Multi-Cycle Acquisition Stage

To acquire loops for a multi-cycle acquisition stage:

1. Press the **Acquire** key to begin acquiring loops. Up to 200 consecutive loops (one per heart cycle) are acquired.

   A memory gauge appears on the top left corner of the imaging screen. It shows how many loops of the possible 200 have been acquired.
2. When you have acquired enough loops for the first view, press the **Enter** key to begin acquiring loops for the second view.

   Alternatively, you can press the **View** soft key to begin acquiring loops for a different view.

   Note: If you do not press the **Enter** key or the **View** soft key, all loops will be labeled with the same view. You can relabel these loops after the multi-cycle acquisition ends.
3. To pause the acquisition at any time, press the **Acquire** key again. To resume the acquisition, press the **Acquire** key again.

4. When all of the views are acquired, press the **Acquire** key to pause the acquisition, and then press the **End Acquire** soft key to view the loops in Image Review.

Acquiring Images Outside of a Stress Echo Protocol

You can temporarily leave the Stress Echo protocol so that you can acquire additional loops or frames, such as images in Color Mode or PW Doppler, outside of the Stress Echo protocol.

To acquire images outside of the stress echo protocol:

1. To pause the protocol, press the **Pause Protocol** soft key.
2. Acquire images in any mode.
3. To return to the Stress Echo protocol, press the **2D** key, and then press the Stress Echo option key.

   The Stress Echo soft keys appear.
4. Press the **Unpause Protocol** soft key.

Using the ROI Box in Stress Echo

When you are in a Stress Echo protocol, a region of interest (ROI) box appears on the image. The area in the ROI box is the portion of the image that is acquired.

Repositioning the ROI Box

To reposition the ROI box:

1. Press the **Select** key until **ROI** is highlighted on the bottom right corner of the imaging screen.
2. Use the trackball to move the ROI box.

Removing the ROI Box from the Imaging Screen

To remove the ROI box from the imaging screen, press the **Hide ROI** soft key.

Displaying the ROI Box

To display the ROI box, press the **Show ROI** soft key.

Moving the 2D Reference Line in Stress Echo

When you are in a Stress Echo protocol and an ROI box appears on the image, the reference line may obscure the acquired image.

To move the reference line in Stress Echo:

1. Press the Stress Echo option key.

   The Stress Echo soft keys appear.
2. Press the **Hide ROI** soft key.
3. Press the **Select** key until **Line** is highlighted on the bottom right corner of the imaging screen.
4. Use the trackball to move the reference line.
5. Press the Stress Echo option key.

   The Stress Echo soft keys appear.
6. Press the **Show ROI** soft key.

Stopping and Resuming a Stress Echo Study

You may stop a partially completed Stress Echo study in order to perform another study and then resume the prior Stress Echo study without having to reacquire resting images. The study can only be resumed on the same day you started the study. You must also be using the same system and preset.

Stopping a Stress Echo Study

To stop a partially completed Stress Echo study:

1. Complete the current stage.
2. Click

Resuming a Stress Echo Study

To resume a Stress Echo study that you started earlier the same day on the same system:

1. Make sure you are in the same preset you used before you stopped the study.
2. Press the **Review** key.
3. Click
4. Use the trackball to highlight the study you want to resume.
5. Click **Open Study**.

   The report opens.
6. To view the images you acquired before you stopped the study, press the **Review** key.
7. Press the **2D** key to resume acquiring images.
8. Click **OK** to confirm that you want to resume the study.

   The view icon and stage-view label appear on the imaging screen.
9. Press the Stress Echo option key to display the Stress Echo soft keys.
10. If the stage you want to acquire does not appear in the stage-view label, use the **Stage** soft key to change the stage.
11. Continue acquiring images.

Stress Echo Review

About Stress Echo Review

After you acquire all of the loops for a view, you view the loops in Image Review. The loops are labeled with the name of the stage, the name of the view, the time (if the timer was on), and the heart rate.

Specifying the Type of Stress Echo Review Display

In Thumbnails, you can view all of the images in the order they were acquired, all of the images of the same view, or all of the images in a stage. To specify the type of display, use the trackball to select **Display Stages**, **Display Views**, or **Show Sequence** from the **Stress Display** drop-down menu.

Selecting the Preferred Stress Echo Loop

After you acquire Stress Echo loops, they appear in Image Review, which is where you select the preferred loop. The default preferred loop is indicated with a check mark in the lower left corner of the image. To choose another loop to be the preferred loop, select the check box in the lower left corner of the image.

All of the loops are still saved, except any loops you marked for deletion. You may change the preferred loop at a later time.

The preferred loop is the loop that you see when you are in the View Stages Stress Display in Thumbnails.

Note: When you export a Stress Echo study, only the preferred loops are exported.

Relabeling Views

You can change the name of the view associated with a loop.

To relabel a Stress Echo view, do one of the following while in Stress Echo review:

1. Use the trackball to move the cursor over the loop.
2. Press the **Select** key.
3. Use the trackball to highlight **Relabel Views**.
4. Use the trackball to highlight the correct view name.
5. Press the **Enter** key.

Or

1. Use the trackball to move the cursor over the view name in the upper left corner of the loop.
2. Press the **Enter** key.
3. Use the trackball to highlight the correct view name.
4. Press the **Enter** key.

Viewing all the Stress Echo Loops for a View

If you acquire more than one loop for a view, only the preferred loop is visible in Thumbnails when you are in the Show Stages Stress Display.

To view all of the loops you acquired for that view, click on the lower left corner of the preferred image. All of the loops you acquired for that view are displayed.

Playing Back Stress Echo Loops

To play back one Stress Echo loop, in Thumbnails, use the trackball to move the cursor over the image and do one of the following:

- Press the **Enter** key twice.
- Press the **Enter** key and click **Play**.

To play back all of the Stress Echo loops for a stage or a view:

1. In Thumbnails, select **Display Stages** or **Display Views** from the **Stress Display** drop-down menu.
2. Use the trackball to move the cursor over the first image, and do one of the following.

- Press the **Enter** key twice.
- Press the **Enter** key and click **Play**.

Performing Wall Motion Scoring

After a Stress Echo study, you can perform wall motion scoring for each wall segment. Graphics showing the wall scores automatically appear in the report.

Note: To enter scores for wall segments, you must be in Image Review, and you must be in a cardiac preset.

To perform wall motion scoring:

1. In Thumbnails, view the stage you want to score.
2. Click
3. Use the slide control at the top of the window to indicate which stage you are scoring.
4. To see the wall segments from different perspectives, click the view icons.
5. Do one of the following:

- If all wall segments are normal, click **All Normal**.

- Use the trackball to move the cursor over the wall segment, press the **Select** key, highlight the wall score for the segment, and press the **Enter** key.

6. Repeat steps 1 through 5 for each stage. Click **Carry Over** to apply the scores from the previous stage to the current stage.

Transducers, Disks, and Peripherals

About Transducers, Disks, and Peripherals

You can use several different transducers, printers, VCRs, and removable disks with your system.

Transducers

About Transducers

You can use the transducers listed below with your EnVisor system. To learn how to use, care for, clean, and disinfect transducers, see the *EnVisor Series Transducer Guide* in the *EnVisor Series Reference Guide*.

Note: The s4 and the c3540 are only available on the EnVisor HD series.

Transducer Name	Model Number	Transducer Type	Frequency	Biopsy Capable?	Harmonics Capable?
PA 4-2	21422A	Sector	2.0–4.0 MHz	Yes	Yes
s4	21330A	Ultraband sector	2.0–4.0 MHz	No	Yes
s8	21350A	Ultraband sector	3.0–8.0 MHz	No	No
s12	21380A	Ultraband sector, intraoperative	5.0–12.0 MHz	No	No
c3540	21321A	Ultraband curved linear array	2.0–5.0 MHz	Yes	Yes
C5040	21373B	Curved linear array	5.0 MHz	Yes	No
CA 5-2	21425A	Curved linear array	2.0–5.0 MHz	Yes	Yes

L12-5 50	9898030022 51	Linear, wide view	7.5 MHz	Yes	No
L1038	21376A	Linear	5.0–12.0 MHz	Yes	No
L5035	21360A	Linear	3.5–6.5 MHz	Yes	No
L7535	21359A	Linear	5.0–10.0 MHz	Yes	No
15-6L	21390A	Intraoperativ e/epicardial	6.0–15.0 MHz	No	No
T6210	21369A	OmniPlane II TEE sector	4.6–6.0 MHz	No	No
C8-4v	9898030022 41	Curved linear array, endovaginal	6.25 MHz	Yes	No
E6509	21336A	Endocavity	5.0–7.5 MHz	Yes	No
D1914C	21221B	Nonimaging	1.9 MHz	No	No

Disks

About Disks

Floppy disks are most often used to back up and restore presets and other system settings.

Optical disks and CD-Rs are most often used to store images, studies, and reports.

Notes:

- An optical disk drive is included with the DICOM Media option.
- The CD headphone jack is not functional on the EnVisor series.

Browsing a Floppy Disk, an Optical Disk, or a CD-R

To see the list of contents of a floppy disk, an optical disk, or a CD-R:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Floppy Disk**, **Optical Disk**, or **CD** tab.
3. Click **Browse Disk**.

   The **Browse Disk** window opens.
4. After looking at the list of the contents of the disk, click **Close**.
5. To close the **Setup** window, click **Close**.

Clearing a Floppy Disk or an Optical Disk

To erase all of the files on a floppy disk or an optical disk:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Floppy Disk** or **Optical Disk** tab.
3. Click **Clear Disk**.

   The **Clear Disk** window opens.
4. To erase all of the files on the disk, click **OK**.
5. To close the **Setup** window, click **Close**.

Formatting a Floppy Disk or an Optical Disk

To format a floppy disk or an optical disk:

1. Press the **Setup** key.

   The **Setup** window opens.
2. Click the **Floppy Disk** or **Optical Disk** tab.
3. Click **Format Disk**.

   The **Format Disk** window opens.

4. Change other settings if necessary.
5. To format the disk, click **Start**.
6. To close the **Setup** window, click **Close**.

Note: You must format a disk before you export to it. If you try to export to an unformatted disk, an error message appears.

Ejecting a Disk

To eject a floppy disk, press the small button right below the floppy disk drive.

To eject a CD-R, press the small button right below the CD drive.

To eject an optical disk, press the small button right above the optical disk drive.

Peripherals

About Peripherals

You can purchase the following optional peripherals to use with your system:

- Sony Digital Graphic Printer UP-D895MD (black and white printer)
- Sony Digital Color Printer UP-D21MD
- Panasonic MD-835 VCR

You can also use the following plain papers printer with your system:

- HP LaserJet 1200 (model number C7044A)
- HP LaserJet 1300 (model number Q1334A)
- HP Deskjet 5550 (model number C6487C)
- HP Deskjet 940c (model number C6431A)

You can also use other VCRs and analog video input printers with your system. To use another VCR, you must purchase the External Video/VCR-Ready option.

Notes:

- Philips does not recommend the use of video input printers. The printers recommended above provide superior results.
- To learn how to connect peripherals to your system, see the EnVisor Series Getting Started Guide.

- The ability to print to a networked DICOM printer is a component of the DICOM Basic option.
- Philips requires that you use Super VHS (SVHS) tapes for VCR recordings.

Printers

About Printers

You can purchase the following optional printers to use with your system:

- Sony Digital Graphic Printer UP-D895MD (black and white printer)
- Sony Digital Color Printer UP-D21MD

You can also use the following plain paper printers with your system:

- HP LaserJet 1200 (model number C7044A)
- HP LaserJet 1300 (model number Q1334A)
- HP Deskjet 5550 (model number C6487C)
- HP Deskjet 940c (model number C6431A)

Notes:

You must assign a Record key to a printer or a VCR before you can use it.

- Philips does not recommend the use of video input printers. The printers recommended above provide superior results.
- To learn how to connect peripherals to your system, see the EnVisor Series Getting Started Guide.
- You can print the images in a study to a networked DICOM printer if you have the DICOM Basic option and if a DICOM print server SCP has been properly configured.
- You cannot assign a **Record** key to a DICOM printer.

Warning: If you plug a plain paper printer into a power source other than the system power supply, you must use a medical grade isolation transformer to insure patient safety.

Changing Settings for an Attached Printer

To change the paper size, page orientation, or copy count for a printer that is attached to your system:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Peripherals** tab.

   The **Peripherals** window opens.

3. Click the name of the printer.
4. Click the name of the printer again to highlight it.
5. Press the **Select** key.
6. Specify settings for the paper size, page orientation, and copy count.
7. Click **OK**.
8. Click **Apply**.
9. Click **Close**.

VCRs

About VCRs

You can purchase the optional Panasonic MD-835 VCR to use with your system.

You can also use other VCRs with your system. To use other VCRs, you must purchase the External Video/VCR-Ready option.

Notes:

- To learn how to connect peripherals to your system, see the EnVisor Series Getting Started Guide.
- Philips requires that you use Super VHS (SVHS) tapes for VCR recordings.

Using a Panasonic MD-835 VCR

You must assign a **Record** key to a Panasonic MD-835 VCR before you can use it.

- To begin recording, press the **Record** key that you assigned to the VCR. Press it again to pause the recording.

  Note: A counter on the imaging screen advances to indicate that the VCR is recording.

- To record verbal comments, press the **Mic** key. Press it again to turn the microphone off and mute your conversation.

To control the playback of the tape, use the VCR soft keys. To display the VCR soft keys, press the **VCR** key..

- To pause the tape during playback, press the **Freeze** key or the **Pause** soft key. To resume play, press the **Freeze** key again or the **Play** soft key.
- To adjust the volume during playback, turn the **Volume** rotary control.

Note: Philips requires that you use Super VHS (SVHS) tapes for VCR recordings.

Using Other VCRs

To use any VCR other than a Panasonic MD-835 VCR, attach the VCR input to the video output of the system. To record, use the keys on the VCR as directed in the VCR user's manual.

To playback any VCR other than a Panasonic MD-835 VCR on the system, press the **VCR** key, press the **External Video** soft key, and use the keys on the VCR as directed in the VCR user's manual. To return to live imaging, press the **External Video** soft key again.

Note: Philips requires that you use Super VHS (SVHS) tapes for VCR recordings.

Using VCR Soft Keys

To change any of the settings listed below, press the oval key below the soft key label.

External Video: Use the **External Video** soft key to display VCR images from any VCR other than the Panasonic MD-835.

Jog: Use the **Jog** soft key to move forward or backward through the recording frame by frame. The **Jog** soft key appears only when you are using a Panasonic MD-835 VCR.

Play: Use the **Play** soft key to play back what you recorded. The **Play** soft key appears only when the playback is paused or stopped and you are using a Panasonic MD-835 VCR.

Pause: Use the **Pause** soft key to pause the playback. The **Pause** soft key appears only when the tape is playing and you are using a Panasonic MD-835 VCR.

FF/RW: Use the **FF/RW** soft key to rewind or fast forward through the video tape. Press the up arrow to fast forward. Press the down arrow to rewind. The **FF/RW** soft key appears only when you are using a Panasonic MD-835 VCR.

Search: Use the **Search** soft key to play the recording forward or backward at a high speed. The **Search** soft key appears only when you are using a Panasonic MD-835 VCR.

Stop: Use the **Stop** soft key to halt the playback of the tape. The **Stop** soft key appears only when the tape is playing and you are using a Panasonic MD-835 VCR.

Foot Switch

About the Foot Switch

The foot switch has three pedals. Each pedal corresponds to a key on the system control panel. The foot switch pedals have different functions in different situations. The following table summarizes the foot switch functions:

Situation	Left Pedal	Middle Pedal	Right Pedal
2D Mode	Record	Freeze	Rec2
3D Mode	Record	Freeze (3D movies only)	Acquire
Panoramic Imaging	Record	None	Acquire
Stress Echocardiography	None	Review	Acquire

You can change the configuration of the foot switch for 2D Mode.

Notes:

- The foot switch is an option that you can purchase separately. It is also included in the Stress echo option.
- The Stress Echo soft keys must be visible in order for the foot switch to function as described in the table above. To display the Stress Echo soft keys, press the Stress Echo option key.

Warning: The foot switch supplied with the ultrasound system meets only drip proof construction requirements and may not be used in the operating room.

Configuring the Foot Switch

You can change the functionality of the foot switch in 2D Mode.

To configure the foot switch:

1. Press the **Setup** key.

   The **Setup** window opens.

2. Click the **Peripherals** tab.

   The **Peripherals** window opens.

3. To assign a control panel key to each foot switch pedal, choose the control panel key from the **Left**, the **Middle**, or the **Right** drop-down menu. Your options are **Record**, **Rec2**, **Rec3**, and **Freeze**.
4. Click **Apply**.
5. Click **Close**.

Warning: The foot switch supplied with the ultrasound system meets only drip proof construction requirements and may not be used in the operating room.

Supplies and Accessories

About Supplies and Accessories

You can purchase various supplies and accessories to use with your system. Supplies are consumable items, such as paper. Accessories are optional items you can purchase separately, such as cables.

Unless otherwise specified, contact your local Philips Sales and Service office to order all parts.

Cables and Power Cords

You can order the following cables and power cords to use with your system:

Description	Part Number
Cables	
LAN external cable	M2540-69080
6’ USB printer cable	M2540-69100
10’ USB cable	M2540-69110
Power Cords	
United Kingdom	M2540-60900
Australia Power	M2540-60901
European Power	M2540-60902
US, Canada, and Japan	M2540-60903
Switzerland	M2540-60906
Denmark	M2540-60912
South Africa	M2540-60917
Israel	M2540-60919
Argentina	M2540-60920
People’s Republic of China	M2540-60922

Miscellaneous Accessories

You can order the following miscellaneous accessories to use with your system:

Description	Part Number
Microphone	9164-0457
Foot switch peripheral kit	M2540-40750

Physio Supplies

You can order the following trunk cables, lead sets, and electrodes to use with Physios:

Description	Part Number
Trunk Cables	
3-Lead trunk cable, AAMI	M1500A
3-Lead trunk cable, IEC	M1510A
AAMI Lead Sets (for North America and Australia)	
3-Lead set, grabber	M1603A
3-Lead set, snap	M1605A
3-Lead set, mini clip 1.5' (0.45m), 1.5" (.45m)	M1608A
3-Lead set, mini clip 2.3' (0.7m), 2.3" (0.7m)	M1609A
IEC Lead Sets (for all other countries)	
3-Lead set, grabber 3.3' (1.0m) (OR use)	M1611A
3-Lead set, grabber 3.3' (1.0m) (ICU use)	M1613A
3-Lead set, snap	M1615A
3-Lead set, mini clip	M1619A

Electrodes	
Foam electrodes, rectangular, pre-gelled, 10/card, 100 cards/case	40420A
Cloth electrodes, pre-gelled, 5/card, 300/case	13944B
Pediatric electrodes, cloth, pre-gelled, 30/pack, 300/case	13951C
Foam electrodes, round, pre-gelled, 30/pack, 300/case	40493E

Printer Supplies and Accessories

Printer Supplies

You can order the following supplies to use with your printers:

Description	Part Number
Black and White Thermal Printer Paper	
Hi-Glossy paper (box of 5 rolls, Sony UPP-110HG)	SNY110HG
Hi-Density paper (box of 5 rolls, Sony UPP-110HD)	SNY110HD
Standard paper (box of 5 rolls, Sony UPP-110S)	SNY110S
Color Printer Paper	
Sony UPC-21L	SNY21L

Note: Philips recommends the use of Hi-Glossy paper (SNY110HG) to maximize print image quality. Using Hi-Density or standard paper will significantly degrade the print quality.

Printer Accessories

You can order the following accessories to use with your printers:

Color Printer Adaptor Kit	M2540-86010
Printer tray (allows you to place a black and white printer on top of the color printer)	M2540-00800
Strap bracket kit	M2540-86020
Strap bracket	M2540-00815

Removable Media

You can order the following removable media to use with your system:

Description	Part Number
3.5" floppy diskette Use a high density (HD) 1.44 MB floppy diskette	You can purchase these diskettes from a computer or office supply store. You can also order the MOD from Philips: M2540-80101.
CD-R diskette 700 MB CD-R certified 40x media	
3.5” magneto optical diskette (MOD) 540 MB rewritable ISO/IEC 15041	

Transducer Supplies

To order transducer accessories in the United States, contact the Philips Medical Supplies Center at 1-800-225-0230. In Canada, call 1-800-387-3154. In other countries, contact your local Philips sales representative.

You can also go to the following Philips web site for the latest ordering information:

www.medical.philips.com/transducercare

You can order the following ultrasound gels and TEE accessories to use with transducers:

Description	Part Number
Ultrasound Gel	
8.5 oz. bottles (case of 12)	40483A
5-liter bottle (to refill 40483A)	40483B
TEE Supplies	
TEE tip protector (box of 24)	M2273A
Bite guards (case of 24)	M1828A
TEE disinfection basin	21110A
TEE sheath kit (12 sheaths)	40487A

Biopsy Kits and Biopsy Sheaths

To order biopsy kits and sheaths, contact:

CIVCO Medical Instruments Co.
102 First Street
Kalona, IA 52247-9589 USA

E-mail: info@civcomedical.com

http://www.civco.com

Call 1-800-445-6741 within the United States or 1-319-656-4447 outside of the United States. To fax orders call 1-319-656-4451.

VCR Supplies and Accessories

VCR Supplies

You can order the following supplies to use with your VCRs:

Description	Part Number
S-VHS tapes (case of 10 tapes, SQ-T120)	13921B

VCR Accessories

You can order the following accessories to use with your VCRs:

Description	Part Number
Video in/out cable	M2540-09070
Audio in/out cable	M2540-69200
Serial cable	M2540-69090
VCR tray (allows you to place a black and white or a color printer on top of the VCR)	M2540-00810
Strap bracket kit	M2540-86020
Strap bracket	M2540-00815

Note: Philips requires that you use Super VHS (SVHS) tapes for VCR recordings.

11

Glossary

2D Reference Image	The 2D reference image is the grayscale ultrasound image.
3D Dataset	In 3D Mode, the 3D dataset is the series of 2D images that you acquire. Information from the 3D dataset is used to create a life-like 3D image.
3D Mode	In 3D Mode, you acquire a series of 2D images, called the 3D dataset. Information from this dataset is used to create a lifelike 3D image.
3D Movie	A 3D movie is an animation of a rendered 3D image.
Acquisition icon	The acquisition icon is a small open box that appears on the bottom right corner of the imaging screen to the right of the transducer frequency and depth when it is possible to acquire an image.
Adaptive Doppler	Adaptive Doppler reduces the background noise in the spectral trace and in the audio.
Adaptive Flow	Adaptive Flow changes the flow frequency to an optimal frequency for that transducer for the selected focal zone.
Angio Box	An angio box appears on the image in Color Power Angio. The amplitude (intensity) of flow in the angio box is represented with different hues.

Angle-to-Flow Arrow	The angle-to-flow arrow, appears on the imaging screen in PW Doppler along with the Doppler cursor line. Use the **Angle** rotary control to position the angle-to-flow arrow parallel to and in the same direction as the blood flow.
Automatic DICOM Export	Automatic DICOM export automatically exports images over a network when you press the **Acquire** key or when you save or close a study.
Automatic DICOM Printing	Automatic DICOM printing automatically sends images to a DICOM printer when you press the **Acquire** key or when you save or close a study.
Automatic Doppler Trace	Automatic Doppler trace automatically traces a frozen Doppler spectrum over one heart cycle and uses the trace to calculate and display the results of key Doppler measurements and calculations.
Automatic Study Deletion	Automatic study deletion automatically deletes a study as soon as all of its images are exported over a network. Automatic study deletion is associated with automatic DICOM export.
Body Marker	A body marker is a graphic that you can place on the imaging screen to indicate the part of the anatomy that you are scanning. When you place the body marker, a transducer icon also appears.
Color Box	A color box appears on the image in Color Mode. The velocity and direction of flow in the color box are represented with different colors for direction and different shades for velocity.

Color MMode	You are in Color MMode when you are in Color Mode and MMode at the same time.
Color Mode	In Color Mode, a color box appears on the image. The velocity and direction of flow in the color box are represented with different colors for direction and different shades for velocity. The colors being used appear in the color bar in the upper right corner of the imaging screen.
Color Power Angio	In Color Power Angio, an angio box appears on the image. The amplitude (intensity) of flow in the angio box is represented with different hues. The colors being used appear in the color bar on the upper right corner of the imaging screen.
Color Power Angio Zoom	Color Power Angio Zoom shows angio flow in a magnified image.
Color Zoom	Color Zoom shows color flow in a magnified image.
CW Focus Diamond	The CW focus diamond lies on the CW reference line. Use the trackball to place the CW focus diamond over the area of interest.
CW Reference Line	The CW reference line appears on the reference image. Use the trackball to place the CW focus diamond on the CW reference line over the area of interest.
DICOM	Digital Imaging and Communications in Medicine (DICOM) is a standard developed by ACR-NEMA to allow medical images to be exchanged between instruments, computers, and hospitals. It includes a number of image file format options with respect to pixel form and format, palette, compression, and so on.

Doppler Modes	Doppler modes measure blood flow or tissue motion from detected frequency shifts in returning sound waves. The frequency shifts can be used to produce audio signals, or they can be displayed graphically in a Doppler spectral trace. Doppler modes are often used to detect leaks, regurgitation, stenosis, and flow changes.
Dual Imaging	Dual Imaging allows you display two images side by side so that you can compare them. You can choose which image is frozen and which is live, or you can freeze both images and choose which one is active so that you can review the frames using Quick Review.
Duplex	Duplex enables you to simultaneously display a live 2D image and a PW Doppler spectral trace.
EnVisor	EnVisor is the general imaging system in the EnVisor series.
EnVisor C	EnVisor is the cardiac imaging system in the EnVisor series.
EnVisor C HD	EnVisor is the high definition cardiac imaging system in the EnVisor series.
EnVisor HD	EnVisor HD is the high definition general imaging system in the EnVisor series.
Exam Type	Related presets are organized in categories called exam types.
Finding Code	A finding code is a predefined diagnostic code based on the assessment and diagnosis of a study.
Focal Caret	A focal caret defines a focal zone, an area where the image is most clearly focused.

Focal Zone	A focal zone is an area where the image is most clearly focused.
Foot Switch	The foot switch has three pedals. Each pedal corresponds to a key on the system control panel. The foot switch pedals have different functions in different situations.
Fusion Icon	A fusion icon appears on the lower left corner of the imaging screen. The fusion icon summarizes information about the fusion setting.
Fusion Settings	Fusion settings control the transmit and receive frequencies for the transducer. Fusion settings apply to 2D Mode and Tissue Harmonic Imaging.
Hospital Information System	The hospital information system (HIS) is the institution's network. Ultrasound systems and other devices are connected to the HIS so that information can be shared between them and stored on servers.
Image Caption	In Image Review, you can add an image caption, a short statement, to an image.
Image Flag	In Image Review, you can add an image flag to an image. Image flags can be helpful when you want to indicate which images will be used, for example, for a teaching demonstration.
Image Review	In Image Review, you view all of the image you acquired. In Image Review, you can view frames and loops, delete frames and loops from the patient study, edit loops, and close the study.

Intelligent Doppler	Intelligent Doppler helps you maintain an optimum cursor angle between the angle-to-flow arrow and the direction of blood flow by automatically moving the PW cursor line whenever the angle-to-flow arrow is moved.
Manual Doppler Trace	In manual Doppler trace, you manually trace the Doppler spectrum over one heart cycle. The results of key Doppler measurements and calculations are displayed in the results box.
Modality Worklist	If your system is connected to the hospital information system, Modality Worklist allows you to display and choose from a list of scheduled patients. When you select a patient from the list, the **Patient Identification** window opens, populated with the patient's demographic information.
MMode Preview	In MMode Preview, you can position the MMode reference line before displaying the MMode trace.
MMode Reference Line	The MMode reference line appears on the reference image in MMode. Information about the movement along the MMode reference line appears in the MMode trace.
MMode Trace	The MMode trace displays information about the movement along the MMode reference line.
MMode Zoom	When you are in MMode, you can magnify a portion of the reference image by entering MMode Zoom. In MMode Zoom, the MMode trace represents only the information in the zoom box.

MPPS	MPPS (Modality Performed Procedure Step) is a feature associated with Modality Worklist. If you specify an MPPS server, your system notifies the hospital information system when a patient study is complete. The list of scheduled patients and patient billing information can then be updated.
MRN	The medical record number (MRN) is a unique alphanumeric identifier assigned to a specific patient.
Multi-Cycle Acquisition	In a Stress Echocardiography multi-cycle acquisition stage, up to 200 loops (one per heart cycle) are continuously acquired and saved to the study, allowing you to continuously acquire loops for all views in a particular stage.
Optical Disk	A magneto optical disk, or optical disk, is a medium density, medium cost storage device. MODs are available in several densities (1x, 2x, 4x, 8x, 12x) where 1x is equivalent to 325MB per side.
Option Key	The EnVisor series system control panel includes four option keys, labeled **1**, **2**, **3**, and **4**. You must assign an option key to certain applications before using them for the first time.
Output Power	The output power is displayed on the imaging screen. The output power is made up of the power index (MI, TIS, TIC, or TIB) followed by the power level (displayed numerically).
PACS	A PACS is a server that stores DICOM-complient data.

Panoramic Dataset	A panoramic dataset is the series of 2D image that is compiled to show a larger area of anatomy.
Panoramic Imaging	In Panoramic Imaging, you acquire a series of images in 2D Mode. These images are called the panoramic dataset. This dataset is compiled to show a larger area of anatomy.
Patient Folder	A patient folder includes all of the studies for one patient.
Patient Study	A patient study includes demographic information, images, quantitative values, and a summary of findings.
Penetration	**Penetration** is a fusion setting that is used to achieve image information at deeper depths. The **Penetration** setting can be helpful in scanning patients with larger body habitus.
Preset	A preset is a group of settings that optimizes the system for a specific type of exam. Presets establish many initial settings, such as gain value, color map, filter, and items on the **Label** and **Measurement** menus.
Pulse Inversion	Pulse Inversion settings are Tissue Harmonic Imaging settings available only with the EnVisor HD series.
PW Sample Volume Gate	The PW sample volume gate is the area in which the velocity is measured in PW Doppler. The information is displayed in the PW spectral trace.
Quad-Cycle Acquisition	In a Stress Echocardiography quad-cycle acquisition stage, four consecutive loops (one per heart cycle) are acquired and saved to the study.

Quick Review	Quick Review allows you to interrupt live imaging and scroll through a loop, scroll through a trace, or cause a loop to play back.
Quick Text	You can place a Quick Text label on the imaging screen anytime. Simply position the cursor with the four arrow keys and start typing.
Report Work Area	The report work area appears to the right of the patient report. It includes several tabs that allow you to edit information that appears in the report.
Resolution	**Resolution** is a fusion setting that is used to achieve image information at shallower depths. The **Resolution** setting optimizes the image for superficial structures.
ROI Box	A region of interest (ROI) box is a box that appears on an image. The area in the ROI box is the portion of the image that is acquired.
SCP	An SCP (service class provider) is a server on a network.
Setup Window	The **Setup** window allows you to change system settings and settings for modes, applications, options, peripherals, and so on.
Single-Cycle Acquisition	In a Stress Echocardiography single-cycle acquisition stage, one loop is acquired and saved to the study.

Soft Keys	Soft keys are the oval keys above the system control panel and below the monitor. The functions of the soft keys change depending on the mode, the application, the preset, and the transducer. The function of each soft key is described above the soft key on the bottom of the imaging screen. To use a soft key, press the up or the down arrow on the key to choose or change the selection that appears above the key on the imaging screen.
Stage-View Label	In Stress Echocardiography, the stage-view label lists the name of the current stage and view.
Stress Echocardiography	Stress Echocardiography (Stress Echo) is a protocol-driven exam that allows a cardiologist to assess cardiac wall motion at various heart rates by acquiring views of the heart at different stages of the exam. A Stress Echo study consists of two to eight stages during which loops are acquired for up to eight anatomical views. Each loop is a sequence of frames captured at systole starting at the R-wave.
Synchronization Mode	In Image Review, when you are playing back more than one loop simultaneously, you can specify the synchronization mode, that is, whether and how the loops are synchronized when they are played back.
Texture	**Texture** is a fusion setting that is used to achieve image information at average depths. The **Texture** setting optimizes the tissue texture at these depths.
Thumbnails	In Image Review, you can view images in a grid format, called Thumbnails.

Tissue Doppler	Tissue Doppler optimizes settings to measure the movement of tissue using color Doppler.
Tissue Harmonic Imaging	Tissue Harmonic Imaging is a 2D Mode in which the transducer receives at twice the transmit frequency. Tissue Harmonic Imaging clears clutter from the image and can be helpful when imaging areas that are filled with fluid, such as the gallbladder or heart chambers.
Transducer Orientation Dot	The transducer orientation dot appears at the upper left corner of a noninverted image.
Trapezoidal Imaging	Trapezoidal Imaging adds additional imaging area by changing a linear transducer's rectangular image to a trapezoidal shape. The extended field of view is often useful in vascular and small parts presets. Use the **Trap** soft key to turn Trapezoidal Imaging on or off.
Triplex	Triplex enables you to simultaneously display a live 2D image with color or angio and a PW Doppler trace.
User-Defined Calculation	You can create your own calculations when you are in an OB/GYN preset. You can add those calculations to the **Calculations** menu for OB/GYN presets.
View Icon	In Stress Echocardiography, a rectangular view icon appears on the upper right corner of the imaging screen that indicates how many views have been acquired for the current stage. The rectangle contains four or eight squares, one for each possible view.

World Key	The two World keys are labeled with a globe. They appear on either side of the space bar. Use a World key to type the characters that appear on the right side of some keys on the keyboard.
Zoom	In Zoom, you can magnify a portion of an image. The magnified area has high resolution because the pixels are reanalyzed, not simply enlarged.
Zoom Box	When you press the **Zoom** key, a zoom box appears on the image. The area in the zoom box is magnified the second time you press the **Zoom** key.

Appendix A: Formulas Used for Calculations

A to B Ratio

The formula for the A/B ratio, **r** (unitless), given the generic velocity, $\mathbf{v}_A$(cm/s), and the generic velocity, $\mathbf{v}_B$ (cm/s), is

$$r = \frac{v_A}{v_B}$$

AC (Abdominal Circumference)

Abdominal Circumference (*cm*) may be computed by two means: if **AC(traced)** is present, then **AC** = **AC(traced)**. If the two abdominal diameters, **ADtrv** and **ADap**, are present, then

$$\pi \times \sqrt{(\mathrm{ADtrv}^2 + \mathrm{ADap}^2)/2}$$

Kurtz, Alfred B., Goldberg, Barry B., *Obstetrical Measurements in Ultrasound: A Reference Manual*, Year Book Medical Publishers, Inc., 1988, p. 33.

Shields J.R., et al., "Fetal Head and Abdominal Circumferences: Ellipse Calculations Versus Planimetry," *Journal of Clinical Ultrasound* (May 1987);15:237–239.

Accel Slope

$$\Delta v / \Delta t$$

where **Δv** is the change in Doppler velocity (cm/sec) and **Δt** is the time interval change (sec).

Note: Use the maximum possible display magnification for best accuracy.

AFI (Amniotic Fluid Index)

The Amniotic Fluid Index is:

$$AFI = (QUAD1 + QUAD2 + QUAD3 + QUAD4)$$

Normal range for AFI: 8.1 cm–18.0 cm.

Rutherford S., et al., "Four Quadrant Assessment of Amniotic Fluid Volume," *Journal of Reproductive Medicine*, 1987, 32:587–589.

Angle

$$A_x = L_x - L_b$$

If $\mathbf{A_x} < 0$, then $\mathbf{A_x} = -\mathbf{A_x}$

If $\mathbf{A_x} > 180$, then $\mathbf{A_x} = 360 - \mathbf{A_x}$

Where $\mathbf{A_x}$ is the α or β angle, $\mathbf{L_x}$ is the α or β line angle, and $\mathbf{L_b}$ is the baseline angle.

Schuler, P., Graf, R., "Sonographic Diagnosis of Hip Dysplasia and Hip Dislocation," 4. Erg.Lig. 7, 1986, Ecomed Verlag. Reprint distributed by Siemens.

Aortic HR (Aortic Heart Rate)

$$60 / (\text{Aortic R-R})$$

Dorland's Illustrated Medical Dictionary, 27th ed., Philadelphia:W. B. Sanders Co., 1988, p. 1425.

Area

$$\left(\frac{1}{5}\right) \sum_{i=1}^{N-1} X_i(Y_i - Y_{i-1}) - Y_i(X_i - X_{i-1})$$

Note: The points on the circumference are assumed to be traced sufficiently close to obtain an accurate result.

Area (I,D)

$$\pi\left(\frac{\text{2D diam}}{2}\right)^2 \frac{\text{V1 VTI}}{\text{V2 VTI}}$$

Oh, J.K., "Prediction of the Severity of Aortic Stenosis by Doppler Aortic Valve Area Determination: Prospective Doppler-Catheterization Correlation in 100 Patients," *Journal of the American College of Cardiology*, Vol. 11, No. 6, June 1988, pp. 1227–1234.

Richards, K.L., et al., "Calculation of Aortic Valve Area by Doppler Echocardiography: A Direct Application of the Continuity Equation," *Circulation*, Vol. 73, No. 5, May 1986, pp. 964–969.

Area (V,D)

$$\pi\left(\frac{\text{2D diam}}{2}\right)^2 \frac{\text{V1 max}}{\text{V2 max}}$$

Oh, J.K., "Prediction of the Severity of Aortic Stenosis by Doppler Aortic Valve Area Determination: Prospective Doppler-Catheterization Correlation in 100 Patients," *Journal of the American College of Cardiology*, Vol. 11, No. 6, June 1988, pp. 1227–1234.

Richards, K.L., et al., "Calculation of Aortic Valve Area by Doppler Echocardiography: A Direct Application of the Continuity Equation," *Circulation*, Vol. 73, No. 5, May 1986, pp. 964–969.

AUA (Average Ultrasound Age)

The Average Ultrasound Age formula is

$$AUA = (GA_1 + GA_2 + \ldots\ldots + GA_n)/n$$

where **n** varies from 1 to 12. The Average Ultrasound Age (AUA) is the average of all (with one exception) the gestational ages that were generated during an exam from acquired values. Gestational ages generated from corrected BPD are not included in the AUA calculation. Also, only gestational ages that are generated from measurable values contribute to the AUA. Gestational ages based on fetal biometric parameters only are inputs to the AUA. GA(LMP), for instance, is not an input to AUA.

You can mark gestational ages for inclusion in, or exclusion from, the AUA. An editable marker field allows you to select which gestational ages should be included in the calculation of the AUA to be included in the report. The gestational age is proceeded by a plus sign (+) to indicate that the age will be included in the AUA, or a minus sign (-) to indicate that the age will be excluded from the AUA. This feature allows you to decide during an obstetric exam that a particular gestational age is out of line with the others and would inappropriately skew the AUA calculation. In this case, you may enter the edit mode and deselect the calculation by replacing + with - for that particular gestational age.

When the system is powered on or you enter a new patient ID, the gestational ages are marked by default for selection or deselection. All gestational ages are marked for inclusion by

default, except for those biometries that have multiple associated authors. In these cases, only one is marked on by default. This ensures that the AUA never includes gestational age calculations based on the same biometry via different authors.

The following table lists the gestational age calculations available and their default states in order of precedence:

Gestational Age	AUA Default State
GA(FL)Hadlock	+
GA(FL)Jeanty	-
GA(FL)Tokyo	-
GA(FL)Osaka	-
GA(HL)Jeanty	+
GA(HL)Osaka	-
GA(TL)Jeanty	+
GA(UL)Jeanty	+
GA(TC)Nimrod	+
GA(CRL)Robinson	+
GA(CRL)Jeant	-
GA(CRL)Remp	-
GA(CRL)Tokyo	-
GA(CRL)Osaka	-
GA(BPD)Hadlock	+
GA(BPD)Jeanty	-
GA(BPD)Tokyo	-
GA(BPD)Osaka	-
GA(HC)Hadlock	+
GA(AC)Hadlock	+
GA(MSD)Hellman	+

GA(GSD)Remp	+
GA(GSD)Tokyo	-
GA(AA)Osaka	+
GA(VL)Tokyo	+

If you choose to override the defaults, the system enforces mutual exclusion when necessary. For example, three gestational ages based on biparietal diameter are available, one by Hadlock, one by Jeanty, and one by Rempen. The default is the Hadlock calculation. If you choose to override the Hadlock calculation, and use the Jeanty calculation, the system automatically deselects the Hadlock calculation and marks it with a minus sign (-).

Biophysical Profile Total

The Biophysical Profile Total formula is

(Movement) + (Tone) + (Breathing) + (Amniotic Fluid Volume)

Category ranges: 0–2 or NA (NA indicates that the category will not contribute to the biophysical profile total.)

Manning, F.A., et al., "Fetal Assessment Based on Fetal Biophysical Profile Scoring," *American Journal of Obstetrical Gynecology*, 1990, 162:703–709.

BSA via Height and Weight (Body Surface Area)

The following are the BSA calculation formulas:

Metric

The DuBois and DuBois body surface area, BSA (m^2), formula, given a metric weight, $\mathbf{W_{kg}}$ (range: 0.5–160.0 kg), and a metric height, $\mathbf{H_{cm}}$ (range: 15.0–204.0 cm), is

$$BSA = 0.007184 \left(W_{kg}^{0.425} H_{cm}^{0.725}\right)$$

English

The DuBois and DuBois body surface area, BSA (m^2), formula, given an "English" weight, $\mathbf{W_{lbs}}$ (range: 1.1–350.0 lbs), and an "English" height, $\mathbf{H_{inches}}$ (range: 6.0–80.0 inches), is

$$BSA = 0.007184 \left(\frac{W_{Lbs}}{2.2}\right)^{0.425} (2.54\, H_{inches})^{0.725}$$

Note: To enter height and weight, press the **Patient** key.

DuBois, D., DuBois, E.F., "A Formula to Estimate the Approximate Surface Area if Height and Weight Be Known," *Nutrition*, Sept–Oct 1989, Vol. 5, No. 5, pp. 303–313.

BSA via Weight (Body Surface Area)

The following are the BSA calculation formulas:

Metric

The Boyd body surface area, BSA (m^2), formula, given a metric weight, W_{kg} (range: 0.5–160.0 kg), is

$$BSA = 0.0004688\ ((1000\, W_{kg})^{0.8168 - 0.0154 \log (1000 W_{kg})})$$

Note: Log function uses base 10.

English

The Boyd body surface area, BSA (m^2), formula, given an "English" weight, W_{lbs} (range: 1.1–350.0 lbs), is

$$BSA = 0.0004688\ ((454.55\, W_{Lbs})^{0.8168 - 0.0154 \log (454.55 W_{Lbs})})$$

Note: To enter the BSA, use the keyboard.

Boyd, Edith, *The Growth of the Surface Area of the Human Body* (originally published in 1935 by the University of Minnesota Press), Greenwood Press, Westport, Connecticut, 1975, p.102.

CI (Cephalic Index)

The Cephalic Index (*unitless*) formula is

$$(BPD / OFD) \times 100$$

The **CI(BPD,OFD)** values for a normal human are 75.9–81.0.

Bezjian, Alex A., "Normal and Abnormal Fetal Growth," presented at the Advanced Ultrasound Seminar, Lake Buena Vista, Florida, January 1982.

Dorland's Illustrated Medical Dictionary, 27th ed., Philadelphia:W. B. Sanders Co., 1988, p. 830.

Hadlock F.P., et al., "Estimating Fetal Age: Effects on Head Shape on BPD," *American Journal of Roentgenology*, 1981, 137:83–85.

Circumference

$$L_{N,1} + \sum_{i=1}^{N-1} L_{i,i+1}$$

where $\mathbf{L_{i,j}}$ is the line segment length between point **i** and point **j**, and where **N** is the total number of points in the enclosed shape.

Note: The points on the circumference are assumed to be traced sufficiently close so that the traced contour closely approximates the real circumference.

CO (Cardiac Output) (2D Mode and MMode)

The cardiac output, $\mathbf{CO_x}$ (normal range: 4–8 1/min), using the *x* volume method, given the heart rate, $\mathbf{HR_x}$, and the stroke volume, $\mathbf{SV_x}$, is

$$CO_x = HR_x \langle \frac{SV_x}{1000} \rangle$$

where $SV_x = EDV_x - ESV_x$

and

CO_x	SV_x	EDV_x	ESV_x
CO(sp-el)	SV(sp-el)	EDV(sp-el)	ESV(sp-el)
CO(bp-el)	SV(bp-el)	EDV(bp-el)	ESV(bp-el)
CO(Bullet)	SV(Bullet)	EDV(Bullet)	ESV(Bullet)
CO(MOD-sp2)	SV(MOD-sp2)	EDV(MOD-sp2)	ESV(MOD-sp2)

CO(MOD-sp4)	SV(MOD-sp4)	EDV(MOD-sp4)	ESV(MOD-sp4)
CO(MOD-bp)	SV(MOD-bp)	EDV(MOD-bp)	ESV(MOD-bp)
CO(mod-Simp)	SV(mod-Simp)	EDV(mod-Simp)	ESV(mod-Simp)
CO(Cubed)	SV(Cubed)	EDV(Cubed)	ESV(Cubed)
CO(Teich)	SV(Teich)	EDV(Teich)	ESV(Teich)

Belenkie, Israel, et al., "Assessment of Left Ventricular Dimensions and Function by Echocardiography," *American Journal of Cardiology*, June 1973, Vol. 31.

CO (Cardiac Output) (Doppler)

The cardiac output, $\mathbf{CO_x}$ (1/min), using the Doppler velocity-time integral, $\mathbf{VTI_x}$ (cm), flow area, $\mathbf{A_x}$ (cm^2), and heart rate, $\mathbf{HR_x}$ (BPM), is

$$CO_x = \frac{VTI_x \times HR_x \times A_x}{1000}$$

where

	VTIx	Ax	HRx
CO(LVOT)	LV VI VTI	LVOT area	Aortic HR

Calafiore, P., Stewart, W.J., "Doppler Echocardiographic Quantitation of Volumetric Flow Rate," *Cardiology Clinics*, May 1990, Vol. 8, No. 2, pp. 191–202.

D to S Ratio

The formula for the diastolic-to-systolic ratio, **r** (unitless), given the systolic velocity, $\mathbf{v_s}$ (cm/s), and the end-diastolic velocity, $\mathbf{v_d}$ (cm/s), is

$$r = \frac{v_d}{v_s}$$

Neumyer, Marsha M. et al., "The Differentiation of Renal Artery Stenosis from Renal Parenchymal Disease by Duplex Ultrasonography," *Journal of Vascular Technology*, Scientific Article, October 1989, pp. 205–216.

Decel Slope

$$\Delta v / \Delta t$$

where **Δv** is the change in vertical dimension Doppler velocity (cm/sec) and **Δt** is the time interval change (sec).

Note: Use the maximum possible display magnification for the most accurate calculation.

Derived GA (Gestational Age)

The gestational age computed from that of an earlier exam, where **PrevExamGA** is in weeks, and the dates are in days, is

$$\text{Prev Exam GA} + ((\text{Current Date} - \text{Prev Exam Date})/7)$$

EDC(AUA)

The estimated date of confinement (*date*) given the average ultrasound age (*date*) formula is

$$EDC(AUA) = DateToday + (40 weeks - AUA)$$

Hagen-Ansert, Sandra L., *Textbook of Diagnostic Ultrasonography*, 3rd ed., The C. V. Mosby Co., 1989, p. 408.

EDC(LMP)

The estimated date of confinement (*date*) given the last menstrual period (*date*) formula is

$$EDC(LMP) = LMP + 40 weeks$$

Hagen-Ansert, Sandra L., *Textbook of Diagnostic Ultrasonography*, 3rd ed., The C. V. Mosby Co., 1989, p. 408.

EDV (Left Ventricular Volume at End Diastole)

Biplane Ellipse Formula

$$(8/(3\pi))(\text{LV Ad sax MV} \times \text{LV Ad apical})/(\text{LVIDd})$$

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Bullet Formula

$$(5/6)(\text{LVAd sax MV})(\text{LVLd apical})$$

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Cubed Formula

$$\text{LVIDd}^3$$

Dodge, H.T., Sandler, D.W., et al., "The Use of Biplane Angiography for the Measurement of Left Ventricular Volume in Man," *American Heart Journal*, 1960, Vol. 60, pp. 762–776.

Belenkie, Israel, et al., "Assessment of Left Ventricular Dimensions and Function by Echocardiography," *American Journal of Cardiology*, June 1973, pg. 31.

Method of Discs, Biplane

$$\frac{\pi}{4}\frac{L}{20}\sum_{i=1}^{20} a_{di}b_{di}$$

where a_{di} is the *i*-th disc diameter of LVAd ap2 MOD, b_{di} is the *i*-th disc diameter of LVAd ap4 MOD, and **L** is the maximum length from LVAd ap2 MOD or LVAd ap4 MOD.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, p. 364.

Method of Discs, Single-Plane, Four-Chamber

$$\frac{\pi}{4}\frac{L}{20}\sum_{i=1}^{20} b_{di}^2$$

where b_{di} is the *i*-th disc diameter of LVAd ap4 MOD and **L** is the length from LVAd ap4 MOD.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, p. 364.

Method of Discs, Single-Plane, Two-Chamber

$$\frac{\pi}{4}\frac{L}{20}\sum_{i=1}^{20} a_{di}^2$$

where a_{di} is the *i*-th disc diameter of LVAd ap2 MOD and **L** is the length from LVAd ap2 MOD.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiology*, Sept–Oct 1989, Vol. 2, No. 5, p. 364.

Modified Simpson's Formula

$$\frac{\text{LVLd apical}}{9}(4(\text{LVAd sax MV}) + 2(\text{LVAd sax PM}) + \sqrt{(\text{LVAd sax MV})(\text{LVAd sax PM})})$$

Weyman, Arthur E., Cross-Sectional Echocardiography, Lea & Febiger, 1985, p. 295.

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Single-plane Ellipse Formula

$$(8/(3\pi))(\text{LVAd apical})^2/(\text{LVLd apical})$$

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Teichholz Formula

$$(7/(2.4 + \text{LVIDd}))(\text{LVIDd}^3)$$

Teichholz, L.E., et al., "Problems in Echocardiographic Volume Determinations: Echocardiographic-Angiographic Correlations in the Presence or Absence of Asynergy," *American Journal of Cardiology*, January 1976, Vol. 37, pp. 7–11.

EF (Ejection Fraction)

$$(EDV - ESV)/EDV$$

Pombo, J.F., "Left Ventricular Volumes and Ejection by Echocardiography," *Circulation*, 1971, Vol. 43, pp. 480–490.

EFW(AC,BPD) via Hadlock

The formula for the estimated fetal weight (grams) via Hadlock using abdominal circumference (range: 15.5–40.0 cm) and biparietal diameter (range: 3.1–10.0 cm) is

$$10^{(1.11 + (0.05845 \times AC) - (0.000604 \times AC^2) - (0.007365 \times BPD^2) + (0.000595 \times BPD \times AC) + (0.1694 \times BPD))}$$

Hadlock F.P., et al., "Sonographic Estimation of Fetal Weight," *Radiology*, 1984, 150:535–540.

EFW(AC,BPD) via Shephard

The formula for the estimated fetal weight (grams) via Shephard using abdominal circumference (range: 15.0–40.0 cm) and biparietal diameter (range: 3.1–10.0 cm) is

$$1000 \times 10^{(-1.7492 + 0.166(BPD) + 0.046(AC) - 0.002646(AC)(BPD))}$$

Shephard M.J., et al., "An Evaluation of Two Equations for Predicting Fetal Weight by Ultrasound," *American Journal of Obstetrics and Gynecology*, January 1982, 142(1):47–54.

EFW(AC,FL) via Hadlock

The formula for the estimated fetal weight (grams) via Hadlock using abdominal circumference (range: 15.0–40.0 cm) and femur length (range: 1.0–8.0 cm) is

$$10^{(1.304 + (0.05281 \times AC) + (0.1938 \times FL) - (0.004 \times AC \times FL))}$$

Hadlock F.P., et al., "Estimation of Fetal Weight with the Use of Head, Body, and Femur Measurements: A Prospective Study," *American Journal of Obstetrics and Gynecology*, 1985, 151(3):333–337.

EFW(AC,HC,FL) via Hadlock

The formula for the estimated fetal weight (grams) via Hadlock using abdominal circumference (range: 10.0–37.0 cm), head circumference (range: 10.0–40.0 cm), and femur length (range: 1.0–8.0 cm) is

$$10^{(1.326 - 0.00326(AC)(FL) + 0.0107(HC) + 0.0438(AC) + 0.158(FL))}$$

Hadlock, F.P., et al., "Estimation of Fetal Weight with the Use of Head, Body, and Femur Measurements: A Prospective Study," *American Journal of Obstetrics and Gynecology*, 1985, 151(3):333–337.

EFW(BPD,AD,FL) via Tokyo

The formula for the estimated fetal weight (grams) via Tokyo using biparietal diameter (range: 3.1–10.0 cm), abdominal diameter (anterior-posterior) (range: 5.0–15.0 cm), abdominal diameter (transverse) (range: 5.0–15.0 cm), and femur length (range: 1.0–8.0) is

$$1.07 \times (BPD)^3 + 3.42 \times ADap \times ADtrv \times FL$$

Norio Shinozuka, et al., "Formulas for Fetal Weight Estimation by Ultrasound Measurements Based on Neonatal Specific Gravities and Volumes," *American Journal of Obstetrics and Gynecology*, 1987, 157(5):1140–5.

EFW(BPD,FTA,FL) via Osaka

The formula for the estimated fetal weight (grams) via Osaka using biparietal diameter (range: 3.1–10.0 cm), fetal trunk abdominal area (range: 20.0–180.0 cm^2), and femur length (range: 1.0–8.0 cm) is

$$1.25647 \times (BPD)^3 + 3.50665 \times FTA \times FL + 6.3$$

Nobuaki Mitsuda, et al., "Image Diagnosis of Fetal Growth," *Obstetrical and Gynecological Practice* (in Japanese), 1988, 37(10):1459–70.

EFW(BPD,HC,AC,FL) via Hadlock

The formula for the estimated fetal weight (grams) via Hadlock using biparietal diameter (range: 3.1–10.0), head circumference (range: 10.0–40.0), abdominal circumference (range: 15.0–40.0 cm), and femur length (range: 1.0–8.0) is

$$10^{(1.5115 + 0.0436 \times AC + 0.1517 \times FL - 0.00321 \times AC \times FL + 0.0006923 \times BPD \times HC)}$$

Hadlock F.P., et al., "Sonographic Estimation of Fetal Weight," *Radiology*, 1984, 150:535–540.

ESV (Left Ventricular Volume at End Systole)

Biplane Ellipse Formula

$$(8/(3\pi))(\text{LVAs apical} \times \text{LVAs sax MV})/(\text{LVIDs})$$

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Bullet Formula

$$(5/6)(\text{LVAs sax MV})(\text{LVLs apical})$$

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Cubed Formula

$$\text{LVIDs}^3$$

Dodge, H.T., Sandler, D.W., et al., "The Use of Biplane Angiography for the Measurement of Left Ventricular Volume in Man," *American Heart Journal*, 1960, Vol. 60, pp. 762–776.

Belenkie, Israel, et al., "Assessment of Left Ventricular Dimensions and Function by Echocardiography," *American Journal of Cardiology*, June 1973, pg. 31.

Method of Discs, Biplane

$$\frac{\pi}{4}\sum_{i=1}^{20} a_{si}b_{si}\frac{\mathrm{L}}{20}$$

where a_{si} is the *i*-th disc diameter of LVAs ap2 MOD, b_{si} is the *i*-th disc diameter of LVAs ap4 MOD, and **L** is the maximum length from LVAs ap2 MOD or LVAs ap4 MOD.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, p. 364.

Method of Discs, Single-Plane, Four-Chamber

$$\frac{\pi}{4}\sum_{i=1}^{20} b_{si}^2\frac{\mathrm{L}}{20}$$

where b_{si} is the *i*-th disc diameter of LVAs ap4 MOD and **L** is the length from LVAs ap4 MOD.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, p. 364.

Method of Discs, Single-Plane, Two-Chamber

$$\frac{\pi}{4}\sum_{i=1}^{20} a_{si}^2 \frac{L}{20}$$

where a_{si} is the *i*-th disc diameter of LVAs ap2 MOD and **L** is the length from LVAs ap2 MOD.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, p. 364.

Modified Simpson's Formula

$$\frac{\text{LVLs apical}}{9}(4(\text{LVAs sax MV}) + 2(\text{LVAs sax PM}) + \sqrt{(\text{LVAs sax MV})(\text{LVAs sax PM})})$$

Weyman, Arthur E., *Cross-Sectional Echocardiography*, Lea & Febiger, Philadelphia, 1985, p. 295.

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Single-plane Ellipse Formula

$$(8/(3\pi))(\text{LVAs apical})^2/(\text{LVLs apical})$$

Folland, E.D., et al., "Assessment of Left Ventricular Ejection Fraction and Volumes by Real-Time, Two-Dimensional Echocardiography," *Circulation*, October 1979, Vol. 60, No. 4, pp. 760–766.

Teichholz Formula

$$(7/(2.4 + \text{LVIDs}))(\text{LVIDs}^3)$$

Teichholz, L.E., et al., "Problems in Echocardiographic Volume Determinations: Echocardiographic-Angiographic Correlations in the Presence or Absence of Asynergy," *American Journal of Cardiology*, January 1976, Vol. 37, pp. 7–11.

Fetal Heart Rate

The formula for heart rate, **r** (BPM), given the peak-to-peak interval over two beats, **t** (sec), is

$r = 120/t$

FL to AC Ratio

The ratio (unitless) of femur length (cm) to abdominal circumference (cm) is

FL / AC

Hadlock F.P., et al., "A Date-Independent Predictor of Intrauterine Growth Retardation: Femur Length/Abdominal Circumference Ratio," *American Journal of Roentgenology*, 1983, 141:979–984.

Hadlock F.P., et al., "Use of Femur Length/Abdominal Circumference Ratio in Detecting the Macrosomic Fetus," *Radiology*, 1985, 154:503–505.

FL to BPD Ratio

The ratio (unitless) of femur length (cm) to biparietal diameter (cm) is

FL / BPD

The typical range for FL/BPD is 0.776 (23 weeks gestational age) to 0.81 (40 weeks gestational age).

Hohler, C., Quetal, T., "Comparison of Fetal Femur Length and Biparietal Diameter in Late Pregnancy," *American Journal of Obstetrics and Gynecology*, December 1981, Vol. 141, No. 7, pp. 759–762.

Flow Volume (Diameter)

The flow volume **V** (l/min) formula, given the flow diameter **D** (cm^2) and the flow mean velocity **MeanV** (cm/s), is

$$V = \frac{60}{1000}\pi\left(\frac{D}{2}\right)^2 MeanV$$

Burns, P.N., "The Physical Principles of Doppler and Spectral Analysis," *Journal of Clinical Ultrasound*, November/December 1987, 15(9):587.

Follicle Volume

Follicle volume =

0.523 X D X D X D

where D = follicular distance

Penzias A.S., et al., "Ultrasound prediction of follicle volume: is the mean diameter reflective?," *Fertility and Sterility*, December 1994, Vol. 62, No. 6, pp. 1274–6.

FS (Fractional Shortening)

$$100\frac{\text{LVIDd} - \text{LVIDs}}{\text{LVIDd}}$$

Belenkie, Israel, et al., "Assessment of Left Ventricular Dimensions and Function by Echocardiography," *American Journal of Cardiology*, June 1973, Vol. 31.

GA(AC) via Hadlock

The formula for gestational age (wk+day) via Hadlock using abdominal circumference (**AC** range: 5.0 cm (12.0 weeks)–38.0 cm (42.0 weeks)) is

$$8.14 + 0.753(\text{AC}) + 0.0036(\text{AC}^2)$$

Hadlock F.P., et al., "Estimating Fetal Age: Computer Assisted Analysis of Multiple Growth Parameters," *Radiology*, 1984, 152:497–501.

GA(BPD) via Hadlock

The formula for gestational age (wk+day) via Hadlock using biparietal diameter (**BPD** range: 1.5 cm–10.1 cm) is

$$9.54 + 1.482(\text{BPD}) + 0.1676(\text{BPD}^2)$$

Hadlock F.P., et al., "Estimating Fetal Age: Computer Assisted Analysis of Multiple Growth Parameters," *Radiology*, 1984, 152:497–501.

GA(BPD) via Jeanty

Gestational age (wk+day) via Jeanty using biparietal diameter (**BPD** range: 2.8–7.9 cm). The following table lists the percentiles in weeks for each value:

BPD	5th %	50th %	95th %		BPD	5th %	50th %	95th %		BPD	5th %	50th %	95th %
2.8	11.3	14.0	16.5		4.8	16.9	19.5	22.3		6.8	23.9	26.4	29.0
2.9	11.5	14.1	16.9		4.9	17.1	19.9	22.5		6.9	24.0	26.7	29.4
3.0	11.9	14.5	17.1		5.0	17.5	20.3	22.9		7.0	24.4	27.1	29.9
3.1	12.1	14.9	17.4		5.1	17.9	20.5	23.1		7.1	24.9	27.5	30.1
3.2	12.3	15.1	17.7		5.2	18.1	20.9	23.5		7.2	25.1	27.9	30.5
3.3	12.5	15.3	18.0		5.3	18.5	21.1	23.9		7.3	25.5	28.3	30.9
3.4	12.9	15.5	18.3		5.4	18.9	21.5	24.1		7.4	26.0	28.7	31.3
3.5	13.1	15.9	18.5		5.5	19.1	21.9	24.5		7.5	26.4	29.1	31.7
3.6	13.5	16.1	18.9		5.6	19.5	22.1	24.9		7.6	26.9	29.5	32.1
3.7	13.7	16.4	19.1		5.7	19.9	22.5	25.1		7.7	27.1	29.9	32.5
3.8	14.0	16.7	19.4		5.8	20.1	22.9	25.5		7.8	27.5	30.3	33.0
3.9	14.3	17.0	19.7		5.9	20.5	23.1	25.9		7.9	28.0	30.7	33.4
4.0	14.5	17.3	19.9		6.0	20.9	23.5	26.1					
4.1	14.9	17.5	20.1		6.1	21.1	23.9	26.5					
4.2	15.1	17.9	20.5		6.2	21.5	24.1	26.6					
4.3	15.4	18.1	20.9		6.3	21.9	24.5	27.1					
4.4	15.7	18.4	21.1		6.4	22.1	24.9	27.5					
4.5	16.0	18.7	21.4		6.5	22.5	25.3	27.9					
4.6	16.3	19.0	21.7		6.6	22.9	25.5	28.3					
4.7	16.5	19.3	22.0		6.7	23.3	26.0	28.5					

Jeanty, Philippe, *Obstetrical Ultrasound*, McGraw Hill, 1983, p. 58.

GA(BPD) via Osaka

Gestational age (wk+day) via Osaka University using biparietal diameter (**BPD** range: 1.3–9.4 cm).

BPD	GA		BPD	GA		BPD	GA		BPD	GA
1.33	10		4.20	18		6.67	26		8.62	34
1.72	11		4.53	19		6.95	27		8.80	35
2.09	12		4.85	20		7.23	28		8.96	36
2.46	13		5.17	21		7.49	29		9.10	37
2.82	14		5.48	22		7.74	30		9.21	38
3.18	15		5.79	23		7.98	31		9.30	39
3.52	16		6.09	24		8.21	32		9.36	40
3.86	17		6.39	25		8.43	33			

Nobuaki Mitsuda, et al., "Image Diagnosis of Fetal Growth," *Obstetrical and Gynecological Practice* (in Japanese), 1988, 37(10):1459–70.

GA(BPD) via Tokyo

Gestational age (wk+day) via Tokyo University using biparietal diameter (**BPD** range: 2.0–9.47 cm).

BPD	GA		BPD	GA		BPD	GA		BPD	GA
2.00	12		4.71	20		7.12	28		8.92	36
2.40	13		5.04	21		7.38	29		9.08	37
2.76	14		5.35	22		7.64	30		9.23	38
3.10	15		5.67	23		7.88	31		9.36	39
3.38	16		5.97	24		8.12	32		9.47	40
3.72	17		6.27	25		8.34	33			
4.05	18		6.56	26		8.55	34			
4.39	19		6.84	27		8.74	35			

Masahiko Mizuno, et al., "Assessment of Fetal Growth using Ultrasound Measurements," *Nichidoku Iho (Japanisch-Deutsche Medizinische Berichte)* (in Japanese), 1989, 34(3):537–544.

GA(CRL) via Jeanty

Gestational age (wk+day) via Jeanty using crown rump length (**CRL** range: 0.5–5.4 cm).

CRL	GA		CRL	GA		CRL	GA		CRL	GA		CRL	GA
0.5	6.3		1.5	8.1		2.5	9.4		3.5	10.4		4.5	11.3
0.6	6.5		1.6	8.1		2.6	9.5		3.6	10.6		4.6	11.4
0.7	6.7		1.7	8.4		2.7	9.5		3.7	10.6		4.7	11.5
0.8	6.8		1.8	8.5		2.8	9.7		3.8	10.7		4.8	11.5
0.9	7.1		1.9	8.5		2.9	9.9		3.9	10.9		4.9	11.7
1.0	7.3		2.0	8.9		3.0	9.9		4.0	10.9		5.0	11.9
1.1	7.4		2.1	8.9		3.1	10.0		4.1	11.0		5.1	11.9
1.2	7.5		2.2	9.0		3.2	10.1		4.2	11.1		5.2	11.9
1.3	7.8		2.3	9.1		3.3	10.1		4.3	11.1		5.3	12.0
1.4	7.8		2.4	9.1		3.4	10.3		4.4	11.1		5.4	12.1

Jeanty, Philippe, *Obstetrical Ultrasound*, McGraw Hill, 1983, p. 56.

GA(CRL) via Osaka

Gestational age (wk+day) via Osaka University using crown rump length (**CRL** range: 0.8–6.5 cm). The following table lists the standard deviation in days:

CRL	GA
0.87	7
1.30	8
2.04	9
3.00	10
4.12	11
5.30	12
6.49	13

Nobuaki Mitsuda, et al., "Image Diagnosis of Fetal Growth," *Obstetrical and Gynecological Practice* (in Japanese), 1988, 37(10):1459–70.

GA(CRL) via Rempen

Gestational age (wk+day) via Rempen using crown rump length (**CRL** range: 0.27–.8 cm). The following table lists the standard deviation (SD) in days for each value:

CRL	GA	SD		CRL	GA	SD		CRL	GA	SD		CRL	GA	SD
0.2	6.0	6		1.8	8.1	6		3.8	10.4	6		6.2	12.6	6
0.3	6.1	6		1.9	8.3	6		3.9	10.5	6		6.4	12.7	6
0.4	6.3	6		2.0	8.4	6		4.1	10.7	6		6.6	12.9	6
0.5	6.4	6		2.1	8.5	6		4.2	10.9	6		6.8	13.0	6
0.6	6.5	6		2.3	8.7	6		4.4	11.0	6		7.0	13.1	6
0.7	6.7	6		2.4	8.9	6		4.5	11.1	6		7.2	13.3	6
0.8	6.9	6		2.5	9.0	6		4.7	11.3	6		7.4	13.4	6
0.9	7.0	6		2.6	9.1	6		4.8	11.4	6		7.7	13.6	6
1.0	7.1	6		2.7	9.3	6		5.0	11.6	6		7.8	13.7	6

1.1	7.3	6		2.9	9.4	6		5.2	11.7	6				
1.2	7.4	6		3.0	9.5	6		5.3	11.9	6				
1.3	7.5	6		3.1	9.7	6		5.5	12.0	6				
1.4	7.7	6		3.3	9.9	6		5.7	12.1	6				
1.6	7.9	6		3.4	10.1	6		5.8	12.3	6				
1.7	8.0	6		3.7	10.3	6		6.0	12.4	6				

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GA(CRL) via Robinson

The formula for gestational age (wk+day) via Robinson using crown rump length (**CRL** range: 0.67 cm (6.3 weeks) to 8.2 cm (14.0 weeks)) is

$$(8.052 \times \sqrt{CRL \times 10} + 23.73)/7$$

Robinson, H.P., Fleming, J.E., "A Critical Evaluation of Sonar Crown-Rump Length Measurements," *British Journal of Obstetrics and Gynecology*, September 1975, 82:702–710.

GA(CRL) via Tokyo

Gestational age (wk+day) via Tokyo University using crown rump length (**CRL** range: 1.4–8.8 cm). The following table lists the associated standard deviation in days for each value:

CRL	GA
1.4	8
2.1	9
2.9	10
3.7	11
4.6	12
5.7	13
7.1	14
8.8	15

Masahiko Mizuno, et al., "Assessment of Fetal Growth using Ultrasound Measurements," *Nichidoku Iho (Japanisch-Deutsche Medizinische Berichte)* (in Japanese), 1989, 34(3):537–544.

GA(FL) via Hadlock

The formula for gestational age (wk+day) via Hadlock using femur length (**FL** range: 0.7–8.2 cm) is

$$10.35 + 2.460(\mathrm{FL}) + 0.170(\mathrm{FL})^2$$

Hadlock F.P., et al., "Estimating Fetal Age: Computer Assisted Analysis of Multiple Growth Parameters," *Radiology*, 1984, 152:497–501.

GA(FL) via Jeanty

The formula for gestational age (wk+day) via Jeanty using femur length (**FL** range: 1.0–8.0 cm) is

$$9.5411757 + 2.9774510 \times FL + 0.10388 \times (FL)^2$$

The following table lists the percentiles in weeks for each value:

FL	5th %	50th %	95th %		FL	5th %	50th %	95th %		FL	5th %	50th %	95th %
1.0	10.4	12.5	14.9		3.4	18.7	20.9	23.1		5.8	28.1	30.3	32.5
1.1	10.7	12.9	15.1		3.5	19.0	21.1	23.1		5.9	28.5	30.7	32.9
1.2	11.1	13.3	15.5		3.6	19.4	21.5	23.9		6.0	28.9	31.1	33.3
1.3	11.4	13.5	15.9		3.7	19.9	22.0	24.1		6.1	29.4	31.5	33.9
1.4	11.7	13.9	16.1		3.8	20.1	22.4	24.5		6.2	29.9	32.0	34.1
1.5	12.0	14.1	16.4		3.9	20.5	22.7	24.9		6.3	30.1	32.4	34.5
1.6	12.4	14.5	16.9		4.0	20.9	23.1	25.3		6.4	30.7	32.9	35.1
1.7	12.7	14.9	17.1		4.1	21.3	23.5	25.7		6.5	31.1	33.3	35.5
1.8	13.0	15.1	17.4		4.2	21.7	23.9	26.1		6.6	31.5	33.7	35.9
1.9	13.4	15.5	17.9		4.3	22.1	24.3	26.5		6.7	32.0	34.1	36.4
2.0	13.7	15.9	18.1		4.4	22.5	24.7	26.9		6.8	32.4	34.5	36.9
2.1	14.1	16.3	18.5		4.5	22.9	25.0	27.1		6.9	32.9	35.0	37.1
2.2	14.4	16.5	18.9		4.6	23.1	25.4	27.5		7.0	33.3	35.5	37.7
2.3	14.7	16.9	19.1		4.7	23.5	25.9	28.0		7.1	33.7	35.9	38.1
2.4	15.1	17.3	19.5		4.8	24.0	26.1	28.4		7.2	34.1	36.4	38.5
2.5	15.4	17.5	19.9		4.9	24.4	26.5	28.9		7.3	34.5	36.9	39.0
2.6	15.9	18.0	20.1		5.0	24.9	27.0	29.1		7.4	35.1	37.3	39.5
2.7	16.1	18.3	20.5		5.1	25.1	27.4	29.5		7.5	35.5	37.7	39.9
2.8	16.5	18.7	20.9		5.2	25.5	27.9	30.0		7.6	36.0	38.1	40.4
2.9	16.9	19.0	21.1		5.3	26.0	28.1	30.4		7.7	36.4	38.5	40.9
3.0	17.1	19.4	21.5		5.4	26.4	28.5	30.9		7.8	36.9	39.1	41.3
3.1	17.5	19.9	22.0		5.5	26.9	29.1	31.3		7.9	37.3	39.5	41.3
3.2	17.6	20.1	22.3		5.6	27.3	29.5	31.7		8.0	37.9	40.0	42.1
3.3	18.3	20.5	22.7		5.7	27.7	29.9	32.1					

Jeanty, Philippe, et al., "Estimation of Gestational Age from Measurements of Fetal Long Bones," *Journal of Ultrasound Medicine*, February 1984, 3:75–79.

GA(FL) via Osaka

Gestational age (wk+day) via Osaka University using femur length (**FL** range: 0.9–7.2 cm).

FL	GA		FL	GA		FL	GA		FL	GA
0.94	13		3.03	20		4.78	27		6.19	34
1.26	14		3.30	21		5.01	28		6.36	35
1.57	15		3.57	22		5.22	29		6.53	36
1.88	16		3.83	23		5.43	30		6.69	37
2.18	17		4.08	24		5.63	31		6.84	38
2.47	18		4.32	25		5.82	32		6.98	39
2.75	19		4.56	26		6.01	33		7.12	40

Nobuaki Mitsuda, et al., "Image Diagnosis of Fetal Growth," *Obstetrical and Gynecological Practice* (in Japanese), 1988, 37(10):1459–70.

GA(FL) via Tokyo

Gestational age (wk+day) via Tokyo University using femur length (**FL** range: 3.2–7.1 cm).

FL	GA		FL	GA		FL	GA		FL	GA
3.23	20		4.64	26		5.82	32		6.82	38
3.44	21		4.76	27		6.01	33		6.93	39
3.65	22		4.98	28		6.19	34		7.04	40
3.87	23		5.19	29		6.37	35			
4.09	24		5.41	30		6.53	36			
4.31	25		5.61	31		6.68	37			

Masahiko Mizuno, et al., "Assessment of Fetal Growth using Ultrasound Measurements," *Nichidoku Iho (Japanisch-Deutsche Medizinische Berichte)* (in Japanese), 1989, 34(3):537–544.

GA(FTA) via Osaka

Gestational age (wk+day) via Osaka University using fetal trunk area (**FTA** range: 5.6–87.0 cm^2).

FTA	GA		FTA	GA		FTA	GA		FTA	GA
5.6	14		21.0	21		43.4	28		69.5	35
7.3	15		23.8	22		47.1	29		73.2	36
9.2	16		26.8	23		50.8	30		76.8	37
11.3	17		29.9	24		54.5	31		80.2	38
13.5	18		33.1	25		58.3	32		83.5	39
15.8	19		36.5	26		62.1	33		86.6	40
18.4	20		39.9	27		65.8	34			

Nobuaki Mitsuda, et al., "Image Diagnosis of Fetal Growth," *Obstetrical and Gynecological Practice* (in Japanese), 1988, 37(10):1459–70.

GA(GSD) via Rempen

Gestational age (wk+day) via Rempen using gestational sac diameter (**GSD1** range: 0.2–7.3 cm). The following table lists the standard deviation (SD) in days:

GSD	GA	SD		GSD	GA	SD		GSD	GA	SD		GSD	GA	SD
0.2	4.9	10		2.1	7.0	10		3.8	9.1	10		5.6	11.6	10
0.3	5.0	10		2.2	7.1	10		3.9	9.4	10		5.8	11.9	10
0.4	5.1	10		2.3	7.3	10		4.0	9.4	10		5.9	12.0	10
0.6	5.3	10		2.4	7.4	10		4.1	9.6	10		6.0	12.1	10
0.7	5.4	10		2.6	7.6	10		4.2	9.7	10		6.2	12.4	10
0.8	5.6	10		2.7	7.7	10		4.4	9.9	10		6.3	12.6	10
1.0	5.7	10		2.8	7.9	10		4.5	10.0	10		6.4	12.7	10

1.1	5.9	10		2.9	8.0	10		4.7	10.3	10		6.5	12.9	10
1.2	6.0	10		3.0	8.1	10		4.8	10.4	10		6.6	13.0	10
1.3	6.1	10		3.1	8.3	10		4.9	10.5	10		6.8	13.3	10
1.4	6.3	10		3.3	8.4	10		5.0	10.7	10		6.9	13.4	10
1.6	6.4	10		3.4	8.6	10		5.1	10.9	10		7.0	13.5	10
1.7	6.6	10		3.5	8.7	10		5.2	11.0	10		7.1	13.7	10
1.8	6.7	10		3.6	8.9	10		5.4	11.3	10		7.2	14.0	10
2.0	6.9	10		3.7	9.0	10		5.5	11.4	10		7.3	14.1	10

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GA(GSD) via Tokyo

Gestational age (wk+day) via Tokyo University using gestational sac diameter (**GSD1** range: 1.0–6.7 cm).

GSD	GA
1.0	4
1.6	5
2.2	6
2.7	7
3.4	8
4.1	9
4.8	10
5.7	11
6.7	12

Masahiko Mizuno, et al., "Assessment of Fetal Growth using Ultrasound Measurements," *Nichidoku Iho (Japanisch-Deutsche Medizinische Berichte)* (in Japanese), 1989, 34(3):537–544.

GA(HC) via Hadlock

Given the head circumference (**HC** range: 5.6–35.7 cm), the gestational age via Hadlock, HC(GA)Hadl (in weeks), is

$$8.96 + 0.540(HC) + 0.0003(HC^3)$$

Hadlock F.P., et al., "Estimating Fetal Age: Computer Assisted Analysis of Multiple Growth Parameters," *Radiology*, 1984, 152:497–501.

GA(HL) via Jeanty

The formula for gestational age (wk+day) via Jeanty using humerus length (**HL** range: 1.0–6.9 cm) is

$$9.6519438 + 2.6200391(HL) + 0.26105367(HL)^2$$

The following table lists the percentiles in weeks for each value:

HL	5th %	50th %	95th %		HL	5th %	50th %	95th %		HL	5th %	50th %	95th %
1.0	9.9	12.5	15.3		3.0	17.1	19.9	22.5		5.0	26.5	29.3	32.0
1.1	10.1	12.9	15.5		3.1	17.5	20.3	23.0		5.1	27.1	29.9	32.5
1.2	10.4	13.1	15.9		3.2	18.0	20.7	23.5		5.2	27.5	30.3	33.1
1.3	10.9	13.5	16.1		3.3	18.4	21.1	23.9		5.3	28.1	30.9	33.5
1.4	11.1	13.9	16.5		3.4	18.9	21.5	24.3		5.4	28.7	31.4	34.1
1.5	11.4	14.1	16.9		3.5	19.3	22.0	24.9		5.5	29.1	32.0	34.7
1.6	11.9	14.5	17.3		3.6	19.7	22.5	25.1		5.6	29.9	32.5	35.3
1.7	12.1	14.9	17.5		3.7	20.1	22.9	25.7		5.7	30.3	33.1	35.9
1.8	12.5	15.1	18.0		3.8	20.5	23.4	26.1		5.8	30.9	33.5	36.5
1.9	12.9	15.5	18.3		3.9	21.1	23.9	26.5		5.9	31.4	34.1	36.9
2.0	13.1	15.9	18.7		4.0	21.5	24.3	27.1		6.0	32.0	34.9	37.5
2.1	13.5	16.3	19.1		4.1	22.0	24.9	27.5		6.1	32.5	35.3	38.1
2.2	13.9	16.7	19.4		4.2	22.5	25.3	28.0		6.2	33.1	35.9	38.7

2.3	14.3	17.1	19.9		4.3	23.0	25.7	28.5		6.3	33.9	36.5	39.3
2.4	14.7	17.4	20.1		4.4	23.5	26.1	29.0		6.4	34.4	37.1	39.9
2.5	15.1	17.9	20.5		4.5	24.0	26.7	29.5		6.5	35.0	37.7	40.5
2.6	15.5	18.1	21.0		4.6	24.5	27.1	30.0		6.6	35.5	38.3	41.1
2.7	15.9	18.5	21.4		4.7	25.0	27.7	30.5		6.7	36.1	38.9	41.7
2.8	16.3	19.0	21.9		4.8	25.5	28.1	31.0		6.8	36.9	39.5	42.3
2.9	16.7	19.4	22.1		4.9	26.0	28.9	31.5		6.9	37.4	40.1	42.9

Jeanty, Philippe et al., "Estimation of Gestational Age from Measurements of Fetal Long Bones," *Journal of Ultrasound Medicine*, February 1984, 3:75–79.

GA(HL) via Osaka

Gestational age (wk+day) via Osaka University using humerus length (HL range: 1.0–6.2 cm).

HL	GA		HL	GA		HL	GA		HL	GA
1.01	13		2.91	20		4.42	27		5.53	34
1.31	14		3.15	21		4.60	28		5.65	35
1.59	15		3.38	22		4.78	29		5.77	36
1.87	16		3.61	23		4.94	30		5.88	37
2.15	17		3.82	24		5.10	31		5.98	38
2.41	18		4.03	25		5.25	32		6.08	39
2.67	19		4.23	26		5.39	33		6.16	40

Nobuaki Mitsuda, et al., "Image Diagnosis of Fetal Growth," *Obstetrical and Gynecological Practice* (in Japanese), 1988, 37(10):1459–70.

GA(MSD) via Hellman

The formula for gestational age (wk+day) via Hellman using mean gestational sac diameter (gestational sac diameter range: 1.0 cm (5.0 weeks)–6.0 cm (12.2 weeks)) is

$$(10((GSD1 + GSD2 + GSD3)/3) + 25.43)/7.02$$

Hellman, L.M., et al., "Growth and Development of the Human Fetus Prior to the Twentieth Week of Gestation," *American Journal of Obstetrics and Gynecology*, 1969, 103:789–800.

GA(SL) via Tokyo

Gestational age (wk+day) via Tokyo University using spine length (**SL** range: 4.0–8.5 cm).

SL	GA		SL	GA		SL	GA		SL	GA
4.05	21		5.57	26		6.72	31		7.70	36
4.39	22		5.82	27		6.93	32		7.89	37
4.71	23		6.06	28		7.13	33		8.08	38
5.01	24		6.30	29		7.32	34		8.27	39
5.30	25		6.51	30		7.51	35		8.47	40

Masahiko Mizuno, et al., "Assessment of Fetal Growth using Ultrasound Measurements," *Nichidoku Iho (Japanisch-Deutsche Medizinische Berichte)* (in Japanese), 1989, 34(3):537–544.

GA(TC) via Nimrod

The formula for gestational age (wk+day) via Nimrod using thoracic circumference (**TC** range: 13.0–35.0 cm) is

$$(TC + 0.44)/0.79$$

Nimrod, C., et al., "Ultrasound Prediction of Pulmonary Hypoplasia," *Obstetrics and Gynecology*, 1986, 68:495–498.

GA(TL) via Jeanty

Gestational Age (wk+day) via Jeanty using Tibia Length (**TL** range: 1.0–6.9 cm) formula is

$$10.055043 + 3.1317668 \times TL + 0.16814056 \times TL \times TL$$

The following table lists the associated percentiles in weeks for each value:

TL	5th %	50th %	95th %		TL	5th %	50th %	95th %		TL	5th %	50th %	95th %
1.0	10.5	13.4	16.3		3.0	18.1	21.0	23.9		5.0	27.0	29.9	32.9
1.1	10.9	13.7	16.5		3.1	18.5	21.4	24.3		5.1	27.5	30.4	33.3
1.2	11.1	14.1	17.0		3.2	18.9	21.9	24.7		5.2	28.0	30.9	33.9
1.3	11.5	14.4	17.3		3.3	19.3	22.1	25.1		5.3	28.5	31.4	34.3
1.4	11.9	14.9	17.7		3.4	19.7	22.5	25.5		5.4	29.0	31.9	34.9
1.5	12.1	15.1	18.0		3.5	20.1	23.1	26.0		5.5	29.5	32.4	35.3
1.6	12.5	15.5	18.4		3.6	20.5	23.5	26.4		5.6	30.0	32.9	35.9
1.7	13.0	15.9	18.9		3.7	21.0	23.9	26.9		5.7	30.5	33.4	36.3
1.8	13.2	16.1	19.1		3.8	21.5	24.4	27.3		5.8	31.0	33.9	36.9
1.9	13.7	16.5	19.5		3.9	21.9	24.9	27.7		5.9	31.5	34.4	37.3
2.0	14.1	17.0	19.9		4.0	22.4	25.3	28.1		6.0	32.0	34.9	37.9
2.1	14.5	17.4	20.3		4.1	22.9	25.7	28.5		6.1	32.5	35.4	38.3
2.2	14.9	17.9	20.7		4.2	23.3	26.1	29.1		6.2	33.0	35.9	38.9
2.3	15.1	18.1	21.1		4.3	23.7	26.5	29.5		6.3	33.5	36.5	39.4
2.4	15.5	18.5	21.4		4.4	24.1	27.1	30.0		6.4	34.1	37.0	39.9
2.5	16.0	18.9	21.9		4.5	24.5	27.5	30.5		6.5	34.5	37.5	40.4
2.6	16.4	19.3	22.1		4.6	25.1	28.0	30.6		6.6	35.1	38.0	41.0
2.7	16.9	19.7	22.5		4.7	25.5	28.5	31.4		6.7	35.7	38.5	41.5
2.8	17.1	20.1	23.0		4.8	26.1	29.0	31.9		6.8	36.1	39.1	42.0
2.9	17.5	20.5	23.5		4.9	26.5	29.4	32.3		6.9	36.9	39.7	42.5

Jeanty, Philippe, et al., "Estimation of Gestational Age from Measurements of Fetal Long Bones," *Journal of Ultrasound Medicine*, February 1984, 3:75–79.

GA(UL) via Jeanty

The formula for gestational age (wk+day) via Jeanty using ulna length (**UL** range: 1.0–6.4 cm) is

$10.034368 + 2.8625722 \times UL + 0.2912470 \times UL \times UL$

The following table lists the percentiles in weeks for each value:

UL	5th %	50th %	95th %		UL	5th %	50th %	95th %		UL	5th %	50th %	95th %
1.0	10.1	13.1	16.1		3.0	18.1	21.1	24.3		5.0	28.5	31.5	34.7
1.1	10.5	13.5	16.5		3.1	18.5	21.7	24.9		5.1	29.1	32.1	35.3
1.2	10.9	13.9	16.9		3.2	19.1	22.1	25.1		5.2	29.7	32.9	35.9
1.3	11.1	14.1	17.3		3.3	19.5	22.7	25.7		5.3	30.3	33.4	36.4
1.4	11.5	14.5	17.7		3.4	20.1	23.1	26.1		5.4	30.9	34.0	37.0
1.5	11.9	15.0	18.0		3.5	20.5	23.6	26.7		5.5	31.5	34.5	37.7
1.6	12.3	15.4	18.4		3.6	21.1	24.1	27.1		5.6	32.1	35.1	38.3
1.7	12.7	15.7	18.9		3.7	21.5	24.5	27.7		5.7	32.9	35.9	38.9
1.8	13.1	16.1	19.1		3.8	22.1	25.1	28.1		5.8	33.4	36.4	39.5
1.9	13.5	16.5	19.5		3.9	22.5	25.5	28.7		5.9	34.0	37.1	40.1
2.0	13.9	16.9	20.0		4.0	23.1	26.1	29.1		6.0	34.5	37.7	40.9
2.1	14.3	17.3	20.4		4.1	23.5	26.7	29.7		6.1	35.3	38.3	41.4
2.2	14.7	17.7	20.9		4.2	24.1	27.1	30.3		6.2	35.9	39.0	42.0
2.3	15.1	18.1	21.1		4.3	24.7	27.7	30.9		6.3	36.5	39.5	42.7
2.4	15.5	18.5	21.5		4.4	25.1	28.3	31.3		6.4	37.1	40.3	43.3
2.5	16.0	19.0	22.1		4.5	25.9	28.9	31.9					
2.6	16.4	19.4	22.5		4.6	26.3	29.4	32.4					
2.7	16.9	19.9	22.9		4.7	26.9	29.9	33.0					
2.8	17.3	20.3	23.4		4.8	27.4	30.5	33.5					
2.9	17.7	20.9	23.9		4.9	28.0	31.1	34.1					

Jeanty, Philippe, et al., "Estimation of Gestational Age from Measurements of Fetal Long Bones," *Journal of Ultrasound Medicine*, February 1984, 3:75–79.

HC (Head Circumference)

Head circumference (cm) (normal range: 8.0 cm–36.0 cm) can be computed by two means: if **HC(traced)** is present, then **HC = HC(traced)**. If the two head diameters, **BPD** and **OFD**, are present, then

$$\pi \times \sqrt{(BPD^2 + OFD^2)/2}$$

Hadlock, F.P., et al., "Fetal Head Circumference: Relation to Menstrual Age," *American Journal of Roentgenology*, August 1982, 138:649–53.

Kurtz, Alfred B., Goldberg, Barry B., *Obstetrical Measurements in Ultrasound: A Reference Manual*, Year Book Medical Publishers, Inc., 1988, p. 33.

Shields, J.R., et al., "Fetal Head and Abdominal Circumferences: Ellipse Calculations Versus Planimetry," *Journal of Clinical Ultrasound*, May 1987, 15:237–239.

HC to AC Ratio

The ratio (unitless) of head circumference (cm) to abdominal circumference (cm) is

$$HC / AC$$

The typical range for **HC/AC** is 0.96 (13 weeks gestational age) to 1.23 (41 weeks gestational age).

Campbell, S., Thoms, A., "Ultrasound Measurement of Fetal Head-to-Abdomen Circumference Ratio in the Assessment of Growth Retardation," *British Journal of Obstetrics and Gynecology*, 1977, 84:165–174.

ICA to CCA Ratio

The formula for the **ICA/CCA** ratio, **r** (unitless), given the internal carotid artery systolic velocity, $\mathbf{v}_{ICA}$ (cm/s), and the common carotid artery systolic velocity, $\mathbf{v}_{CCA}$ (cm/s), is

$$r = \frac{v_{ICA}}{v_{CCA}}$$

Garth K., Carroll B., et al., "Duplex Ultrasound Scanning of the Carotid Arteries with Velocity Spectrum Analysis," *Radiology*, June 1983, 147:826.

LA to AO Ratio

$$\frac{\text{LA dimension}}{\text{Ao root diam}}$$

Roelandt, Joseph, *Practical Echocardiology*, vol. 1 of *Ultrasound in Medicine Series*, ed. Denis White, Research Studies Press, 1977, p. 270.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, p. 364.

Length

$$\sqrt{(X_1 - X_2)^2 + (Y_1 - Y_2)^2}$$

where (X_1, Y_1) and (X_2, Y_2) are the endpoint coordinates of the line segment.

Note: When making small length measurements, use the maximum permissible display magnification for the most accurate calculations.

LVLd % diff

LVLd % diff is the MOD long axis (at end diastole) length percentage difference between apical 4 and apical 2 views.

$$100\left(\frac{\max(\text{LVAd ap2 MOD}, \text{LVAd ap4 MOD}) - \min(\text{LVAd ap2 MOD}, \text{LVAd ap4 MOD})}{\max(\text{LVAd ap2 MOD}, \text{LVAd ap4 MOD})}\right)$$

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, pp. 358–367.

LVLs % diff

LVLs % diff is the MOD long-axis length at end systole percentage difference between apical 4 and apical 2 views.

$$100\left(\frac{\max(\text{LVAs ap2 MOD}, \text{LVAs ap4 MOD}) - \min(\text{LVAs ap2 MOD}, \text{LVAs ap4 MOD})}{\max(\text{LVAs ap2 MOD}, \text{LVAs ap4 MOD})}\right)$$

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, pp. 358–367.

LVmass(AL)d

$$1.05\left(\frac{5}{6}(A_1(L+t)) - \frac{5}{6}A_2L\right)$$

where

A_1 represents LVAd sax epi, the LV epicardial SAX area at the level of the papillary muscle tips at end diastole

A_2 represents LVAd sax PM, the LV endocardial SAX cavity area at the level of the papillary muscle tips at end diastole

L represents LVLd apical, the LV long-axis length at end diastole (via apical four-chamber or two-chamber views)

t is a representative myocardial wall thickness with the formula

$$\sqrt{\frac{A_1}{\pi}} - \sqrt{\frac{A_2}{\pi}}$$

Reichek, N., et al., "Anatomic Validation of Left Ventricular Mass Estimates from Clinical Two-Dimensional Echocardiography: Initial Results," *Circulation*, February 1983, Vol. 67, No. 2, pp. 348–352.

Schiller, N.B., et al., "Recommendations for Quantification of the LV by Two-Dimensional Echocardiography," *Journal of the American Society of Echocardiography*, Sept–Oct 1989, Vol. 2, No. 5, pp. 358–367.

Wyatt, H.L., et al., "Cross-sectional Echocardiography: Analysis of Models for Quantifying Mass in the Left Ventricle in Dogs," *Circulation*, 1979, Vol. 60, pp. 1104–1113.

LVmass(AL)dI

$$\frac{\text{LVmass(AL)d}}{\text{BSA}}$$

LVmass(C)d

$$0.8(1.04)((\text{IVS}_d + \text{LVID}_d + \text{LVPW}_d)^3 - \text{LVID}_d^3) + 0.6$$

Devereux, R.B., et al., "Echocardiographic Assessment of Left Ventricular Hypertrophy: Comparison to Necropsy Findings," *American Journal of Cardiology*, 1986, Vol. 57, pp. 450–458.

Sahn, D., et al., The Committee on MMode Standardization of the American Society of Echocardiography, "Recommendations Regarding Quantitation in MMode Echocardiography: Results of a Survey of Echocardiographic Measurements," *Circulation*, 1978, Vol. 58, No. 6, pp. 1072–1083.

LVmass(C)dI

$$\frac{\text{LVmass(C)d}}{\text{BSA}}$$

LVOT Area

The calculated area, *LVOT*Area (cm^2), of the Left Ventricular Outflow Tract is

*LVOT*Area = (pi/4) x (LVOTDiam)

Hagen-Ansert, Sandra L., *Textbook of Diagnostic Ultrasound*, ed. 3, The C.V. Mosby CO., 1989, pp.73.

Maximum Pressure Gradient

Short form:

$$4\left(\frac{V_2 max}{100}\right)^2$$

where V_2 is the maximum distal velocity (in cm/sec).

The short form is clinically applicable in the case of stenosis where $V_2 > 4V_1$.

Yoganathan, Ajit P., et al., "Review of Hydrodynamic Principles for the Cardiologist: Applications to the Study of Blood Flow and Jets by Imaging Techniques," *Journal of the American College of Cardiology*, 1988, Vol. 12, pp. 1344–1353.

Maximum Pressure Gradient (Aortic Flow) (Full Bernoulli)

$$4\left(\left(\frac{\text{AoV2 max}}{100}\right)^2 - \left(\frac{\text{LVV1 max}}{100}\right)^2\right)$$

Yoganathan, Ajit P., et al., "Review of Hydrodynamic Principles for the Cardiologist: Applications to the Study of Blood Flow and Jets by Imaging Techniques," *Journal of the American College of Cardiology*, 1988, Vol. 12, pp. 1344–1353.

Maximum Pressure Gradient (Aortic Flow) (Simplified Bernoulli)

$$4\left(\frac{\text{AoV2 max}}{100}\right)^2$$

Yoganathan, Ajit P., et al., "Review of Hydrodynamic Principles for the Cardiologist: Applications to the Study of Blood Flow and Jets by Imaging Techniques," *Journal of the American College of Cardiology*, 1988, Vol. 12, pp. 1344–1353.

Maximum Pressure Gradient (Aortic Insufficiency)

$$4\left(\frac{\text{AImax vel}}{100}\right)^2$$

Callahan, Mark J., et al., "Validation of Instantaneous Pressure Gradients Measured by Continuous-Wave Doppler in Experimentally Induced Aortic Stenosis," *American Journal of Cardiology*, 1985, Vol. 56, pp. 989–993.

Maximum Pressure Gradient (Mitral Regurgitation)

$$4\left(\frac{\text{MRmax vel}}{100}\right)^2$$

Stamm, R. Brad, et al., "Quantification of Pressure Gradients Across Stenotic Valves by Doppler Ultrasound," *Journal of the American College of Cardiology*, 1983, Vol. 2, No. 4, pp. 707–718.

Maximum Pressure Gradient (Mitral Valve)

$$4\left(\frac{\text{MVpeak vel}}{100}\right)^2$$

Yoganathan, Ajit P., et al., "Review of Hydrodynamic Principles for the Cardiologist: Applications to the Study of Blood Flow and Jets by Imaging Techniques," *Journal of the American College of Cardiology*, 1988, Vol. 12, pp. 1344–1353.

Maximum Pressure Gradient (Pulmonary Insufficiency)

$$4\left(\frac{\text{PI max vel}}{100}\right)^2$$

Masuyama, T. et al., "Continuous-wave Doppler Echocardiographic Detection of Pulmonary Regurgitation and Its Application to Noninvasive Estimation of Pulmonary Artery Pressure," *Circulation*, 1986, Vol. 74, No. 3, pp. 484–492.

Maximum Pressure Gradient (Pulmonic Valve) (Simplified Bernoulli)

$$4\left(\frac{\text{PAV2 max}}{100}\right)^2$$

Yoganathan, Ajit P., et al., "Review of Hydrodynamic Principles for the Cardiologist: Applications to the Study of Blood Flow and Jets by Imaging Techniques," *Journal of the American College of Cardiology*, 1988, Vol. 12, pp. 1344–1353.

Mean Pressure Gradient (Full Bernoulli)

$$\text{AoV2 trace} - \text{LV V1 trace}$$

Yoganathan, Ajit P., et al., "Review of Hydrodynamic Principles for the Cardiologist: Applications to the Study of Blood Flow and Jets by Imaging Techniques," *Journal of the American College of Cardiology*, 1988, Vol. 12, pp. 1344–1353.

Mean Pressure Gradient (Simplified Bernoulli)

Short form:

$$PG = \text{V2 trace}$$

The short form is clinically applicable in the case of stenosis where $V_2 > 4V_1$.

Yoganathan, Ajit P., et al., "Review of Hydrodynamic Principles for the Cardiologist: Applications to the Study of Blood Flow and Jets by Imaging Techniques," *Journal of the American College of Cardiology*, 1988, Vol. 12, pp. 1344–1353.

MM HR (MMode or 2D Heart Rate)

$$60/(\text{MM R-R int})$$

Dorland's Illustrated Medical Dictionary, 27th ed., Philadelphia:W. B. Sanders Co., 1988, p. 1425.

MV E/A (Mitral Valve E-to-A Ratio)

$$\frac{\text{MVE max vel}}{\text{MVA max vel}}$$

Maron, Barry J., et al., "Noninvasive Assessment of Left Ventricular Diastolic Function by Pulsed Doppler Echocardiography in Patients with Hypertrophic Cardiomyopathy," *Journal of the American College of Cardiology*, 1987, Vol. 10, pp. 733–742.

MV Flow Area

The calculated Mitral Valve Flow area, *MVFlowArea* (cm^2) is

MVFlowArea = (pi/4) x (*MVDiam1* x *MVDiam2*)

Hagen-Ansert, Sandra L., *Textbook of Diagnostic Ultrasound*, ed. 3, The C.V. Mosby CO., 1989, pp.73.

MV P1/2t

$$1000\left(\frac{MV\text{max vel}\left(1-\frac{1}{\sqrt{2}}\right)}{MV\text{Decel slope}}\right)$$

where **MV max vel** is the peak velocity on the spectrum and **MV Decel slope** is the slope of the spectrum as it declines from the max velocity.

Note: Position the crosshair along the deceleration slope as far away as possible from the peak velocity point for the most accurate calculation.

Hatle, L., et al., "Non-invasive Assessment of Atrioventricular Pressure Halftime by Doppler Ultrasound," *Circulation*, Vol. 60, 1979, pp. 1096–1104.

MVA (P1/2t)

$$\frac{220}{\text{MVP}\frac{1}{2}t}$$

Note: Use points as far apart as possible on the deceleration slope and the maximum permissible strip chart speed for the most accurate calculation.

Goldberg, Barry B., Kurtz, Alfred B., *Atlas of Ultrasound Measurements*, Year Book Medical Publishers, Inc., 1990, p. 65.

Stamm, R. Brad, et al., "Quantification of Pressure Gradients Across Stenotic Valves by Doppler Ultrasound," *Journal of the American College of Cardiology*, 1983, Vol. 2, No. 4, pp. 707–718.

Ovarian Volume

Length x Width x Thickness x 0.523

Andolf, Ellika, et al., "Ultrasound Measurement of the Ovarian Volume," *Acta Obstet Gynecol Scand*, 1987; 66:387-389.

% Area Stenosis

The percentage of stenosis, **S** (%), formula, given a true lumen area, $\mathbf{A_{true}}$ (cm^2), and the residual lumen area, $\mathbf{A_{residual}}$ (cm^2), is

$$S = 100\left(\frac{A_{true} - A_{residual}}{A_{true}}\right)$$

Diagnostic ranges: 0–20%, normal; 20–60%, mild; 60–80%, moderate; 80–90%, severe; 90–99%, critical; 100%, occluded.

Jacobs, Norman M., et al., "Duplex Carotid Sonography: Criteria for Stenosis, Accuracy, and Pitfalls," *Radiology*, 1985, 154:385–391.

% Diameter Stenosis

The percentage of stenosis, **S** (%), formula, given a true lumen diameter, $\mathbf{D_{true}}$ (cm), and the residual lumen diameter, $\mathbf{D_{residual}}$ (cm), is

$$S = 100\left(\frac{D_{true} - D_{residual}}{D_{true}}\right)$$

Diagnostic ranges: 0–20%, normal; 20–60%, mild; 60–80%, moderate; 80–90%, severe; 90–99%, critical; 100%, occluded.

Honda, Nobuo, et al., "Echo-Doppler Velocimeter in the Diagnosis of Hypertensive Patients: The Renal Artery Doppler Technique," *Ultrasound in Medicine and Biology*, 1986, Vol. 12(12), pp. 945–952.

PI (Pulsatility Index Using Time-Averaged Mean of the Peaks)

The formula for pulsatility index, **PI**, given a maximum velocity, ($\mathbf{V_{max}}$ in cm/s), a minimum velocity ($\mathbf{V_{min}}$ in cm/s), and a mean velocity ($\mathbf{V_{mean}}$ in cm/s), is

$$PI = \frac{Vmax - Vmin}{Vmean}$$

Burns, Peter N., "The Physical Principles of Doppler and Spectral Analysis," *Journal of Clinical Ultrasound*, November/December 1987, Vol. 15, No. 9, p. 585.

Pressure Half-time

$$1000\left(\frac{\text{max vel}\left(1-\frac{1}{\sqrt{2}}\right)}{\text{Decel slope}}\right)$$

where **max vel** is the peak velocity on the spectrum and **Decel slope** is the slope of the spectrum as it declines from one of the values for **max vel** listed in the following table:

Pressure Half-time	Max Vel	Decel Slope	Flow
Ao P1/2t	AI max vel	AI dec slope	Aortic flow
MV P1/2t	MV P1/2t max v	MV dec slope	Mitral flow
PI P1/2t	PI max vel	PA dec slope	Pulmonic flow
TV P1/2t	TV P1/2t max v	TV dec slope	Tricuspid flow
P1/2t	Dec max vel	Decel slope	Other flow

Note: Position the crosshair along the deceleration slope as far away as possible from the peak velocity point for the most accurate calculation.

Hatle, L., et al., "Non-invasive Assessment of Atrioventricular Pressure Halftime by Doppler Ultrasound," *Circulation*, 1979, Vol. 60, pp. 1096–1104.

Proximal Isovelocity Surface Area (PISA)

MR ERO (Mitral valve effective regurgitant orifice area) (cm2)

$$\frac{\text{MR flow rate}}{\text{MR max vel}}$$

MR flow rate (Mitral valve regurgitation flow rate) (cm3/sec)

$$\text{MR PISA} \times \text{MR alias vel}$$

MR PISA (Mitral valve regurgitation proximal isovolumic surface area) (cm2)

$$2\pi \times (\text{MR PISA radius})^2$$

MR RF (Mitral valve regurgitant fraction) (%)

$$\left(\frac{\text{MR volume}}{\text{SV (MV)}}\right) \times 100$$

MR volume (Mitral valve regurgitant volume) (ml)

$$\text{MR ERO} \times \text{MR VTI}$$

Enriquez-Sarano, M., "Effective Regurgitant Orifice Area: A Noninvasive Doppler Development of an Old Hemodynamic Concept," *Journal of the American College of Cardiology*, 1994, Vol. 23, No. 2:443-51.

Gardin, J., "Doppler Color Flow Proximal Isovelocity Surface Area (PISA): An Alternative Method of Estimating Volume Flow Across Narrowed Orifices, Regurgitant valves, and Intracardiac Shunt Lesions." *Echocardiography*, 1992, Vol. 9, No. 1:39-41.

Shandas, R., et al., "Experimental Studies to Define the Geometry of the Flow Convergence Region," *Echocardiography*, 1992, Vol. 9, No. 1:43-50.

Utsunomiya, T., et al., "Regurgitant volume estimation in patients with mitral regurgitation: initial studies using the Color Doppler Proximal isovelocity surface area method," *Echocardiography*, 1992, vol. 9, No. 1:63-74.

Qp to Qs Ratio

$$\left(\frac{D_P}{D_S}\right)^2\left(\frac{V_P}{V_S}\right)$$

where $\mathbf{D_P}$ represents the diameter of the effective flow area of the main pulmonary artery, $\mathbf{D_S}$ represents the diameter of the effective flow area of the aortic valve, $\mathbf{V_P}$ represents maximum velocity of the pulmonary flow, and $\mathbf{V_S}$ represents the maximum velocity of the aortic flow.

Cloez J.L., Schmidt, et al., "Determination of Pulmonary to Systemic Blood Flow Ratio in Children By a Simplified Doppler Echocardiographic Method," *Journal of the American College of Cardiology*, April 1988, Vol. 11, No. 4, pp. 825–830.

RI (Resistivity Index)

The formula for resistivity index, **RI** (*unitless*), given a maximum velocity, $\mathbf{V_{max}}$ (*cm/s*), and a minimum velocity, $\mathbf{V_{min}}$ (*cm/s*), for a vessel is

$$RI = \frac{Vmax - Vmin}{Vmax}$$

Burns, P.N., "The Physical Principles of Doppler and Spectral Analysis," *Journal of Clinical Ultrasound*, November/December 1987, Vol. 15, No. 9, p. 586.

RV Sys Press

$$4\left(\frac{\max\ vel^{TR}}{100}\right)^2 + RApress$$

Stevenson, J.G., "Comparison of Several Noninvasive Methods for Estimation of Pulmonary Artery Pressure," *Journal of the American Society of Echocardiography*, June 1989, Vol. 2, pp. 157–171.

Yock, Paul G. and Popp, Richard L., "Noninvasive Estimation of Right Ventricular Systolic Pressure by Doppler Ultrasound in Patients with Tricuspid Regurgitation," *Circulation*, 1984, Vol. 70, No. 4, pp. 657–662.

S to D Ratio

The formula for the systolic-to-diastolic ratio, **r** (unitless), given the systolic velocity, $\mathbf{v_s}$ (cm/s), and the end-diastolic velocity, $\mathbf{v_d}$ (cm/s), is

$$r = \frac{v_s}{v_d}$$

Ameriso, S., et al., "Pulseless Transcranial Doppler Finding in Takayasu's Arteritis," *Journal of Clinical Ultrasound*, September 1990, 18:592–6.

Stroke Volume (2D)

$$SV_x = EDV_x - ESV_x$$

where the stroke volume, $\mathbf{SV_x}$ (ml); the end-diastolic volume, $\mathbf{EDV_x}$ (ml); and the end-systolic volume, $\mathbf{ESV_x}$ (ml), are

SV_x	EDV_x	ESV_x
SV(sp-el)	EDV(sp-el)	ESV(sp-el)
SV(bp-el)	EDV(bp-el)	ESV(bp-el)
SV(Bullet)	EDV(Bullet)	ESV(Bullet)
SV(MOD-sp2)	EDV(MOD-sp2)	ESV(MOD-sp2)
SV(MOD-sp4)	EDV(MOD-sp4)	ESV(MOD-sp4)
SV(MOD-bp)	EDV(MOD-bp)	ESV(MOD-bp)
SV(mod-Simp)	EDV(mod-Simp)	ESV(mod-Simp)
SV(Cubed)	EDV(Cubed)	ESV(Cubed)
SV(Teich)	EDV(Teich)	ESV(Teich)

Gorge, G., et al., "High Resolution Two-dimensional Echocardiography Improves the Quantification of Left Ventricular Function", *Journal of the American Society of Echocardiography*, 1992, 5: 125–34.

Roelandt, Joseph, *Practical Echocardiology*, vol. 1 of *Ultrasound in Medicine Series*, ed. Denis White, Research Studies Press, 1977, p. 124.

Stroke Volume (Doppler)

$$SV_x = VTI_x A_x$$

where the stroke volume, SV_x (ml), using Doppler flow, given a velocity-time integral, VTI_x (cm), and the flow area, A_x (cm^2), are

SV_x	VTI_x	A_x
SV	V2 VTI	Flow area
SV(Ao)	Ao V2 VTI	Ao root area
SV(LVOT)	LV V1 VTI	LVOT area
SV(MV)	MV V2 VTI	MV flow area
SV(PV)	PA V2 VTI	MPA area
SV(MV)	MV V2 VTI	MV flow area
SV(TV)	TV V2 VTI	TV flow area

Hatle, Liv, Angelsen, Bjorn., *Doppler Ultrasound in Cardiology: Physical Principles and Clinical Applications*, 2nd ed., Philadelphia:Lea and Febiger, 1985, p. 306.

Systolic Ratio

The formula for the systolic ratio, **r** (unitless), given the end-systolic velocity for vessel 1, $\mathbf{v_1}$ (cm/s), and the end-systolic velocity for velocity 2, $\mathbf{v_2}$ (cm/s), is

$$r = \frac{v_1}{v_2}$$

Garth, K., et al., "Duplex Ultrasound Scanning of the Carotid Arteries with Velocity Spectrum Analysis," *Radiology*, June 1983; 147:826

TC (Thoracic Circumference)

Thoracic circumference can be computed by two means. If **TC** (**traced**) is present, then **TC** = **TC** (**traced**). If the two thoracic diameters, **TDtrv** and **TDap**, are present, then

$$\pi \times \sqrt{(TDtrv^2 + TDap^2)/2}$$

Kurtz, Alfred B., Goldberg, Barry B., *Obstetrical Measurements in Ultrasound: A Reference Manual*, Year Book Medical Publishers, Inc., 1988, p. 33.

Uterine Volume

Length x Width x Thickness

Goldstein, S.R., et al.,"Estimation of Nongravid Uterine Volume Based on a Nomogram of Gravid Uterine Volume: Its Value in Gynecologic Uterine Abnormalities," *Obstetrics & Gynecology*, 72, No. 1:86-90, July 1988.

Levine, Sandra, Filly, Roy, Creasy, Robert K., "Identification of Fetal Growth Retardation by Ultrasonographic Estimation of Total Intrauterine Volume," *Journal of Clinical Ultrasound*, 1979;7:21-26.

Volume (Ellipsoid Three-Axis)

The formula for ellipse volume, **vol** (cm^3), from its three perpendicular axes: length, **l;** width, **w;** and height, **h**, is

$$vol = l \times w \times h \times 0.523$$

Jeanty, Philippe, "Measurement of Fetal Kidney Growth on Ultrasound," *Radiology*, July 1982, 144:159–162.

Emamian, S.A., et al., "Kidney Dimensions at Sonography: Correlation with Age, Sex, and Habitus in 665 Adult Volunteers," *American Journal of Radiology*, 1993, 160:83–86.

Weight Percentiles

To aid the clinician in diagnosing fetal weight discrepancies and discordant growth, weight percentiles are available for each estimated fetal weight on the obstetrics report. These indicate where the fetus lies in relation to the normal range of values, based on both clinical (expected GA or LMP) and ultrasound (AUA) data.

The fetal weight value is displayed within a shaded box (inverse video) if the percentile is less than 10 percent or greater than 90 percent. In Analysis Setup, you can turn off weight percentiles so they are not included in the report.

The following table of fetal weight smoothed percentiles (Brenner) is used by the system to determine weight percentiles. The weights in the table are represented in grams.

Gestational Age (wks)	10%	25%	50%	75%	90%
8			6.1		
9			7.3		
10			8.1		
11			11.9		
12		11.1	21.1	34.1	
13		22.5	35.3	55.4	
14		34.5	51.4	76.8	
15		51.0	76.7	108	
16		79.8	117	151	
17		125	166	212	
18		172	220	298	
19		217	283	394	
20		255	325	460	
21	280	330	410	570	860
22	320	410	480	630	920
23	370	460	550	690	990
24	420	530	640	780	1080
25	490	630	740	890	1180
26	570	730	860	1020	1320
27	660	840	990	1160	1470
28	770	980	1150	1350	1660
29	890	1100	1310	1530	1890
30	1030	1260	1460	1710	2100
31	1180	1410	1630	1880	2290
32	1310	1570	1810	2090	2500

33	1480	1720	2010	2280	2690
34	1670	1910	2220	2510	2880
35	1870	2130	2430	2730	3090
36	2190	2470	2650	2950	3290
37	2310	2580	2870	3160	3470
38	2510	2770	3030	3320	3610
39	2680	2910	3170	3470	3750
40	2750	3010	3280	3590	3870
41	2800	3070	3360	3680	3980
42	2830	3110	3410	3740	4060
43	2840	3110	3420	3780	4100
44	2790	3050	3390	3770	4110

Brenner, William, et al., "A Standard of Fetal Growth for the United States of America," *American Journal of Obstetrics and Gynecology*, November 1976, 126:555–564.